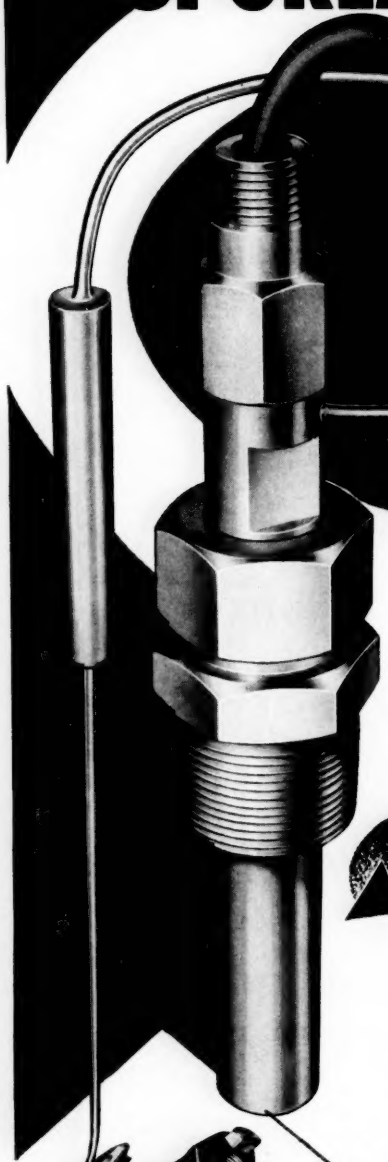
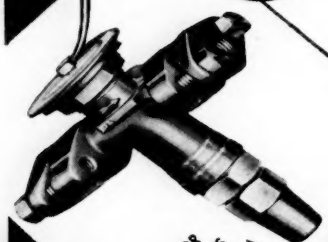
INDUSTRIAL REFRIGERATION

SPORLAN LEVEL MASTER CONTROL

LMC

is the PEAK PERFORMANCE Answer to all FLOODED SYSTEMS





Here's why!

Because only the Sporlan Level-Master Control uses standard Sporlan thermostatic expansion valves with matching level-master elements. This perfect combination of LMC element and thermostatic expansion valve assures a positive liquid level control for Ammonia and Freon 12 up to 100 Tons . . . and for Freon 22, up to 180 Tons.

MODULATED FLOW. The Level-Master Control provides a modulated flow and maintains practically a static liquid level in the low side.

NO MOVING PARTS. The insert bulb controlling the liquid level has no moving parts. Control does not operate through use of a mechanical float device of any kind.

SIMPLIFIED AND ECONOMICAL INSTALLATION. The insert bulb can be placed directly in the shell, accumulator or liquid leg for direct contact with refrigerant. Existing float control systems can be easily and economically converted.

NOT AFFECTED BY TURBULENCE. Regardless of any agitation which might occur in the low side, the effect on the Level-Master is merely that of striking a mean level and holding that level constant.

TIGHT CLOSING. Tight closing is assured by the spring action in the thermostatic expansion valve during shut-down periods when the heater element is off and liquid refrigerant is in contact with the bulb. The Peak Performance of Sporlan Thermostatic Expansion Valves has been proven over a period of many years.

Write for Sporlan Bulletin 60-15 today.
Then you'll be sure to use the Sporlan Level-Master Control on all your flooded jobs.

SPORLAN VALVE COMPANY

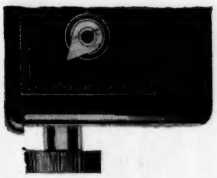
7525 SUSSEX AVENUE • ST. LOUIS 17, MO.

EXPORT DEPT. AD AURIEMA INC. · 89 BROAD STREET, NEW YORK 4, N.Y.

ELECTRIC Heating Cable DEFROSTERS

for LOW TEMPERATURE DOORS

1 • Temperature adjustment control.



2 • Adjustable thermostat for range of +85° to +245° F.

3 • Steel electrical outlet box for making connection between heating element and thermostat—inlet for power.

4 • Rabbeted channels into casing.

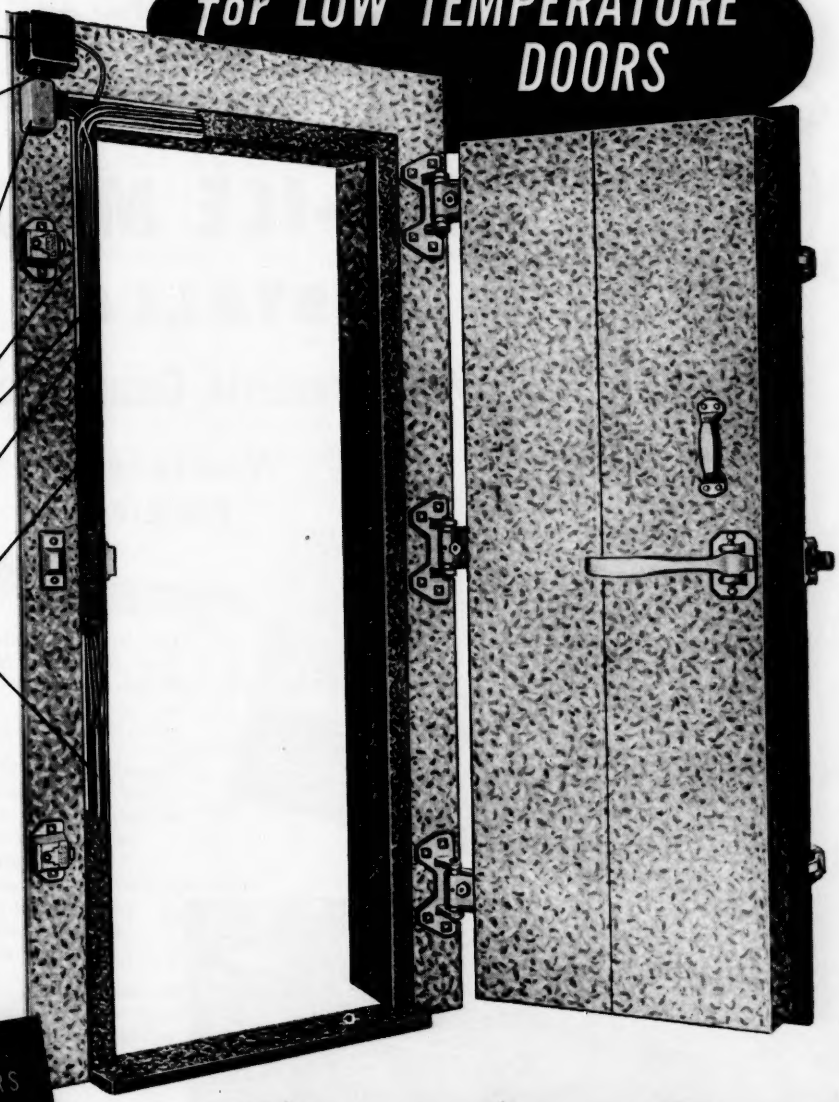
5 • Fireproof No. 26 gauge galvanized metal lined inside channel.

6 • Lead covered "heater cables" (4) held down securely by clips —approximately 20 watts to a foot. (110 volts—60 cycles).

7 • No. 10 gauge galvanized steel cover plates—removable.

8 • Capillary tube controls (on and off) thermostat.

The purpose of heating cables is to prevent icing conditions at the frame and sill areas where the door gaskets make their contact. The cables which are recessed into the frame casing are electrically heated and controlled by a "calibrated thermostat" (new improved feature by Butcher Boy), adjustable above the "dew point" of the air temperature. Since the heat expended prevents condensation it thus prevents freezing conditions.



"Butcher Boy"

QUALITY SINCE 1885

Send FOR NEW 1956 CATALOG ILLUSTRATING 8 NEW IMPROVED FEATURES

BUTCHER BOY REFRIGERATOR DOOR CO.
1000 Butcher Boy Drive • Harvard, Illinois

Gentlemen:
Send me your new 1956 Refrigerator Doors catalog

Name_____

Firm Name_____

Address_____

City_____ State_____

South of the Border

200 tons daily capacity

TUBE-ICE MACHINES

INSTALLATION

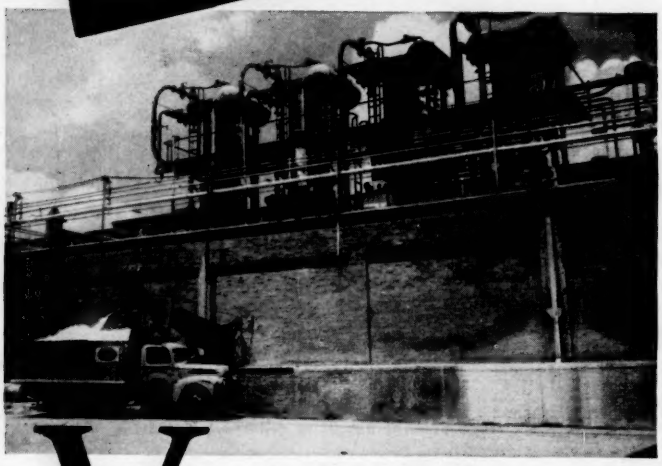
for **Cerveceria Cuauhtemoc, S. A.**

Monterrey, Mexico

This leading Mexican brewery installed two Vogt Tube-Ice Machines to serve their Monterrey plant several years ago, and two additional units were recently placed in operation to meet increased plant production.

Mounted on top of the ice storage building, a total of 200 tons of crushed Tube-Ice is discharged daily from the battery of ice machines to the storage room beneath. The ice is used for keeping beer cool during delivery by trucks and is supplied free of cost to refreshment stands and beer gardens where the product of Cerveceria Cuauhtemoc is sold.

In addition to making ice, distinctly versatile Tube-Ice units can be easily adapted to the production of cold water for wort cooling in any brewery. Write for Bulletin TI-3. Dept. 24-RIIR.



HENRY VOGT MACHINE CO., Louisville, Ky.
BRANCH OFFICES:
New York • Philadelphia • Chicago • Cleveland
St. Louis • Cincinnati • Dallas • Charleston, W. Va.
San Francisco

Vogt *Automatic* TUBE-ICE MACHINES

STAND-OUT

Food Technologists Keep Eye on Radiation

FOOD technologists are viewing recent developments in the application of ionizing radiation to food preservation with mixed emotions, says an editorial in "Food and Drug Research," published by Food Research Laboratories Inc., Long Island City, N.Y. Although the tempo of research in this field is increasing rapidly, the editorial concludes, the road ahead for the embryo food radiation industry appears to be long and arduous.

That the future holds promise of major developments appears to be a safe prediction although authorities differ widely on how imminent and how big the impact will be. At a recent symposium in Boston sponsored by Tracer-Tab Inc., some of the more immediate practical applications received emphasis. Costwise, the anticipated availability of spent fuel elements from commercial power reactors now being built may be a large factor in bringing radiation facilities into economic focus.

Engineering designs utilizing these gamma sources indicates that Trachina may be destroyed in fresh pork at a cost of 29 cents per 200-pound hog. Potatoes may be treated to prevent sprouting for about $4.00 per ton. Cereals may be freed of viable insects for about two cents per 100 pounds. Fresh meats, prepackaged at the packing house may be treated to extend shelf life significantly for as little as one cent a pound. These and many other applications are examples of what L. E. Brownell of the University of Michigan calls "radio-pasteurization" as distinct from sterilization. The radiation dosages required for these pasteurization effects are relatively low and appear to be without deleterious effects on flavor and palatability of the foods treated.

Effective sterilization of foods by radiation is meeting with somewhat more limited success at the present time. Dosages needed raise costs, on the basis of current estimates, to levels 100 to 1,000 times the cost of conventional heat sterilization. Undesirable changes in flavor and texture often accompany sterilization due to chemical reactions initiated by the radiation. Some progress has been reported in the five million dollar research program being sponsored by the Quartermaster Food and

(*Continued on page* 50)

Industrial Refrigeration

formerly **ICE AND REFRIGERATION**
Now in its 65th Year of Publication
J. F. NICKERSON, FOUNDER

Vol. 130 **April, 1956** **Number 4**

Contents

Human Element Big Cause of Compressor Failures 13
Warehousemen Prepare For Annual Meeting 18
Modern Processing Plant Produces Leading Brands of Frozen Orange Concentrate 19
Low Temperatures For Treatment of Metals Improve Quality and Reduce Costs 20
French Chalk Mines Convertible to Underground Storage 22
Frozen Foods for the Arabian Desert 23
Private Warehousing May Not Be The Answer 26
Industrial Test Refrigerators Improved 27
National Association Practical Refrigerating Engineers 30
NH_3 Purger Operation — Hydrogen Liberation and Foul Gas Re-absorption 30
News Notes and Chapter Activities 33
From The President's Desk 34
NAPRE Question Box 40

Departments

What's New in Equipment ... 4
Press Briefs 8
In The Spotlight 11
Coming Conventions 49
Deaths 51
News of People 52
Manufacturers News 52
Catalogs and Bulletins 54

The Cover:

Two 450 hp Fairbanks-Morse units drive principal refrigeration equipment in Citrus Inc. orange concentrate plant at Haines City, Florida. These are splash-proof motors installed with special waterproof insulation, 360 rpm, 3-phase, 60 cycle, 2300 volt, unity power factor, synchronous motors with 220 volt space heaters for reducing moisture hazards, driving 4-cylinder 11 5/8 x 10 inch York compressors. The annual plant capacity is 800,000 cases and there is storage for 500,000 cases. See story on page 19.

Published Monthly by NICKERSON & COLLINS CO.
General Offices: 433 N. Waller Ave., Chicago 44, Ill. Telephones: AUstin 7-1303-04-05

H. T. McDERMOTT, EDITOR AND PUBLISHER — E. R. CURRY, MANAGING EDITOR — J. R. KELAHAN, TECHNICAL EDITOR — H. D. BUSBY, ASSOCIATE EDITOR

ADVERTISING—O. RHODIUS ELOFSON, DIRECTOR — EDW. DAVIESON, Advertising Repersentative

HELEN B. SMITH, SECRETARY — E. P. SWANSON, SUBSCRIPTION — V. S. SMITH, PRODUCTION

CHANGE OF ADDRESS—Notify publisher and your local post office promptly of change of mailing address to avoid non-receipt of copies. Copies incorrectly addressed, because of failure to notify publisher, cannot be replaced. Upon request, post office will provide, without cost, convenient "change of address" mailing cards.

INDUSTRIAL REFRIGERATION, Vol. 130, No. 4. Published monthly at 433 N. Waller Ave., Chicago, Ill., U.S.A., by Nickerson & Collins Co. Yearly subscription in the U. S., $2.00 per year; other countries, $3.00. Single copies, 25 cents.

Copyright 1955 by Nickerson & Collins Co. Acceptance under Section 34.64 P. L. & R. authorized.

The entire contents of this journal are covered by general copyright, and special permission must be obtained from the publishers of same before reprinting long extracts or reproducing illustrations; but editors desiring to do so are welcome to use not more than one-third of an article, providing credit is given.

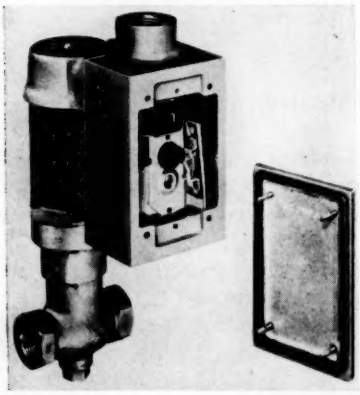
Industrial Refrigeration is indexed regularly by Engineering Index, Inc., and is microfilmed for library use by University Microfilms.

What's New

MACHINERY
APPLIANCES • PROCESSES

New Timer Valves Control Flow Automatically

THE flow of liquids, gas, or air can be controlled automatically with new timer valves available from the Automatic Controls Corp., Ann Arbor, Michigan. The units consist of a solenoid valve and a timer control sealed in a water-tight case.



Timer Valve by Armstrong Controls Corp.

These timer valves turn the flow on or off at desired time intervals. As they are available in a wide variety of timing cycles, they have a large number of industrial applications. For example, they can be used to turn a flow either on or off, or both on and then off, at any desired time. They can perform this function each day with repeat cycle operation—no re-setting is needed. The timer valves can also be used to obtain continuously intermittent operation—that is, they can be set to open and close a valve a certain number of times per minute, hour, or day. The new timer valves fit all standard pipes ⅜ inch and larger, and operate on 110 or 220 volt, 60 cycle current.

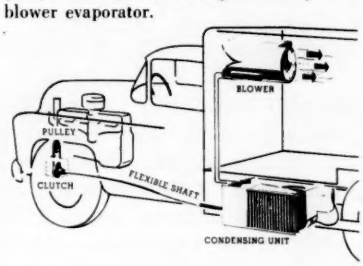
Fire Ban Pipe Covering

FIRE-BAN, a cement-type insulation coating, is now being specified for use with MMM, Inc.'s Styrofoam low-temperature pipe covering, Vapo*Wall. This coating is white, weatherproof, fire-proof, non-cracking and economical. A single coat, as thin as ⅛ inch (rated as incombustible by Underwriters Laboratories) can be applied for a total cost of 12 to 20 cents per square foot by either trowel, brush or spray.

Fire-Ban, a product of E. H. O'Neill Floors Company, has a smooth, durable, washable surface which makes it ideal for use in food-processing plants. MMM, Inc.'s insulation engineers point out that this coating is serviceable in temperatures as low as minus 100 F. and will not crack under such extremes.

New Continuous Truck Refrigeration System

A CONTINUOUS truck refrigeration system weighing only 410 pounds, having simplicity of operation, fast pull down and automatic frost prevention, has been introduced by the Kold-Hold Division of Tranter Manufacturing, inc., Lansing, Mich. Named the Kold-Trux Mark 100B, this new unit is complete with power source, condensing assembly and blower evaporator.



Major components in the new Kold-Hold Kold-Trux Mark B series of continuous truck refrigeration announced by Kold-Hold Division, Tranter Mfg. Inc.

The system is driven by a simple, mechanical power train to save the weight of auxiliary equipment. Power is derived from the engine crankshaft pulley through a simple electric clutch. It is then transferred to the condensing unit through a flexible shaft of the type used in many other truck power-transmission applications. This entire assembly weighs only 64 pounds.

Stand-by power is provided by an electric motor that drives the condensing unit without operating the truck engine. In this way a smaller electric motor provides more tons of stand-by refrigeration. Mark B systems are available with 1, 1½, 2 and 3 hp. capacity stand-by motors.

The fan and shrouding design of the system condenser utilizes the entire coil surface for dissipation of heat. The fan is located on the cool air side of the coil where it works more efficiently. Thus it operates without the noise common in other systems, yet is much lighter and more efficient. The entire condensing unit weighs only 286 pounds, including the high-speed automotive-type compressor, 1 hp electric motor and other component parts.

A "Turbo-Jet" blower produces a complete cycle of air movement in seconds. Its entire coil surface is effective cooling area due to the shrouding and fan design. As a result, there is greater movement of air through the coil and superior circulation of air through the truck body. The complete blower weighs only 60 pounds. Condenser and blower fans are driven by a high speed generator that requires no battery. Current is produced independently of the truck electrical system.

It is an automatically balanced system. The compressor operates whenever the engine is running unless turned off by a switch. An anti-frost valve on the blower coil balances the system delivering the capacity needed for the load. It also prevents frost accumulation on the coil to eliminate loss of efficiency.

Key to the frost prevention is a temperature-sensing device that is set at the Kold-Hold factory to start opening at 32½ F. This is connected to a control bulb that is inserted among the fins but not in contact with the tubes. A hot gas line from the compressor discharge is connected to the gas inlet on the temperature-sensing device. The outlet from the valve leads to the coil. When fin temperature reaches 32½ F, the temperature-sensing valve begins to open. This allows hot gas to enter the coil and prevent formation of efficiency-robbing frost. When the hot gas reaches the control bulb, the heat closes the valve and the refrigeration cycle is started again.

New Nitrogen Div. Logotype

A NEW logotype for use in advertising and printed material to show users of basic industrial chemicals the connection between the Division and its parent company, has been announced by Nitrogen Division, Allied Chemical & Dye Corporation, New York.

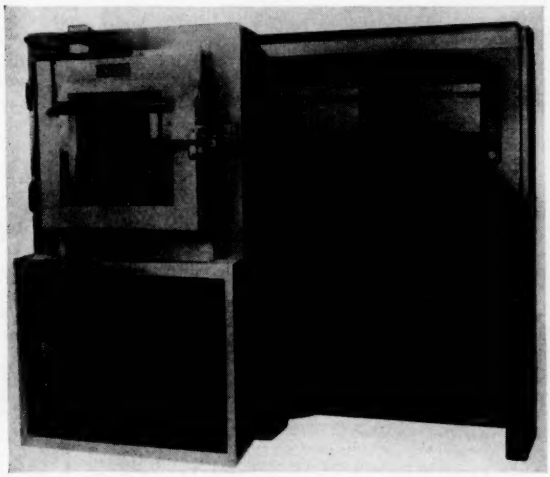
Nitrogen Division, which produces anhydrous ammonia, ammonia liquor, ammonium sulfate, sodium nitrate, formaldehyde, ethanolamines, nitrogen textroxide, ethylene oxide, ethylene glycols, methanol, nitrogen solutions, UF Concentrate-85, fertilizers and feed supplements, finds the new logotype works with any product. It also has the advantage of decreasing confusion with other concerns with similar names. For Nitrogen Division, one of the newest allied divisions, it makes introduction of a host of potential new products easier, especially in new fields, where Allied or its divisions might be known, but not necessarily the Nitrogen Division itself.

Compound For Brine Leaks

MANUFACTURERS of "Quickseal" used for many years to seal leaks in brine tanks for ice manufacturing plants, announce that the product has recently been used in another application. A user in Vineland, New Jersey, advised the manufacturer that he used the compound to stop leaks in the brine circulating grids beneath his ice skating rink floor. Subsequent investigation convinced the firm that the compound would do very well for such applications. "Quickseal" is manufactured and distributed by the Born Refrigerating Company, Chicago.

New Instrument Console

A UNIQUE console form of instrument localization, used in conjunction with low temperature and environmental test equipment, has been announced by Tenney Engineering, Inc., 1090 Springfield Road, Union, New Jersey. One advantage of this Instrument console is that it can readily be remoted for any operation which involves danger. This remote control presents the



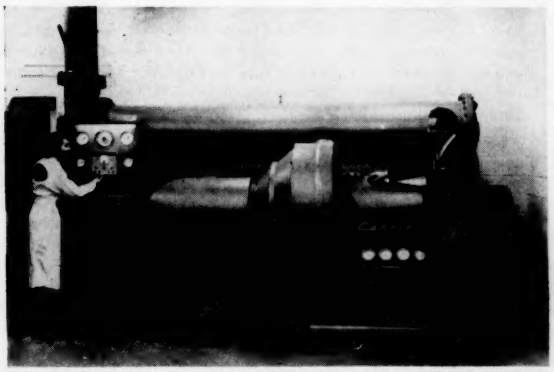
New instrument console developed by Tennsy Engineering, Inc.

answer to inaccessible locations. They are available in many sizes and configurations to fit requirements of purchasers of environmental test equipment. However, these consoles are standard equipment with all Tenney stratosphere, low temperature, and combination models. Various modifications covering the operation of shafts, lines, or similar pentrations are available upon request.

New Hermetic Centrifugal Machine Reduces Installed Cost

A NEW hermetic centrifugal refrigerating machine designed to reduce installation cost and provide simple push-button operation, and maximum efficiency for large air conditioning systems has been unveiled by Carrier Corporation.

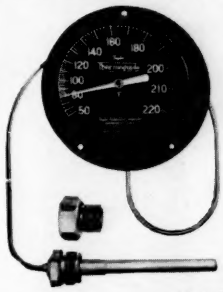
The machine is extremely quiet, virtually vibrationless, lightweight and requires no foundation, an important element in low installation expense. Due to these features it can be located on the upper floors or roof of a building. It will be initially available in 30 different capacities ranging from 100 to 325 tons, a ton of capacity representing the cooling effect which would be produced by a similar amount of ice melting over a 24-hour period. Multiple units can be used where larger capacities are required.



Carrier Corporation's newly-designed hermetic centrifugal refrigerating machine for use with multi-story building and other large air conditioning installations.

Need thermometers? ...ASK TAYLOR

IF you do you can't do better than call your Taylor Field Engineer. He is a specialist in temperature measurement. And Taylor makes a wide variety of thermometers for just about every possible application in the refrigeration industry. If you prefer, write for **Catalog 300.** Taylor Instrument Companies, Rochester, N.Y., or Toronto, Canada.

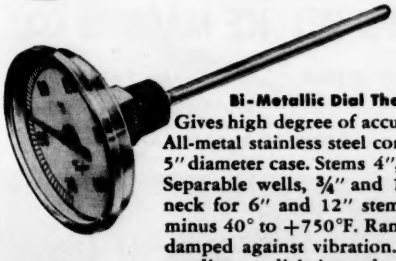


THERMOGUIDE* Dial Thermometer
An extremely reliable and sturdy vapor-actuated instrument for Brine Lines, Brine Tanks, Ammonia Lines, Cold Storage Rooms, Refrigerators, etc. Variety of standard ranges from minus 40° to + 120°F. Four forms of bulb and connection. Case diameter 6½".
No. 14KV123, $38

Metal Wall Thermometer
Easily read, even in dimly lighted areas. Non-fading red liquid in magnifying tube and black figures and graduations on white background. Flanged edges give tube maximum protection. Range minus 40° to + 70°F., in 1° divisions. Length 12".
No. 1106, $2.75

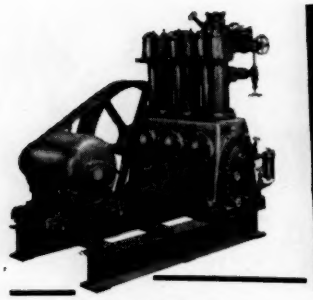
Taylor Industrial Thermometer
Exclusive BINOC* tubing, makes it three times easier to read. For Cold Water, Brine, Ammonia, Condenser, Hot Water and Steam Lines, Brine Tanks, Cold Storage Rooms, etc. Many bulb and stem styles and angles. Ranges minus 40° to 950°F. or equivalent Centigrade. Illustrated,
No. 11E5385, $29.50

*Reg. U.S. Pat. Off.

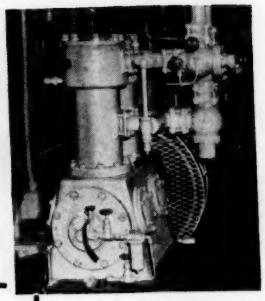


Bi-Metallic Dial Thermometer
Gives high degree of accuracy at low cost. All-metal stainless steel construction. 3" or 5" diameter case. Stems 4", 6", 9", and 12". Separable wells, ¾" and 1"; 2" extension neck for 6" and 12" stems. Ranges from minus 40° to +750°F. Ranges up to 400°F. damped against vibration. **$16** to **$26**, depending on dial size and stem length.

Taylor Instruments
MEAN ACCURACY FIRST



MODEL D IN SIZES
from 25 to 150-ton capacity



HOWE BOOSTER COMPRESSORS
For low temperature service.

THERE IS A

HOWE

COMPRESSOR

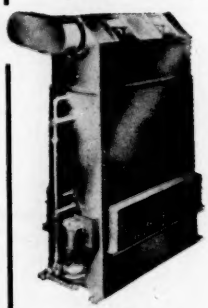
FOR EVERY SIZE LOAD

AND APPLICATION

THREE generations of Howe engineers have been helping the plant owner, design and operating engineer solve their refrigeration problems. The "know-Howe" behind the design and application of Howe equipment is geared directly to efficient refrigeration installations. Hundreds of repeat orders prove *it pays to know Howe!* Our engineers will gladly make recommendations . . . no obligation, of course.

WRITE FOR LITERATURE

RAPID FREEZE UNIT COOLER
Designed for blast and freezer storage



EVAPORATIVE CONDENSERS
10 ton to 200 ton capacity

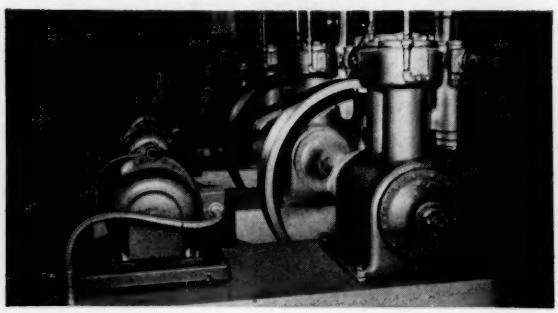
Since 1912, manufacturers of ammonia compressors, condensers, coolers, fin coils, locker freezing units, air conditioning (cooling) equipment.

HOWE ICE MACHINE CO.

2829 MONTROSE AVENUE CHICAGO 18, ILLINOIS

Distributors in Principal Cities • Cable Address: HIMCO Chicago

MODEL G — 5 TONS TO 25 TONS CAPACITY

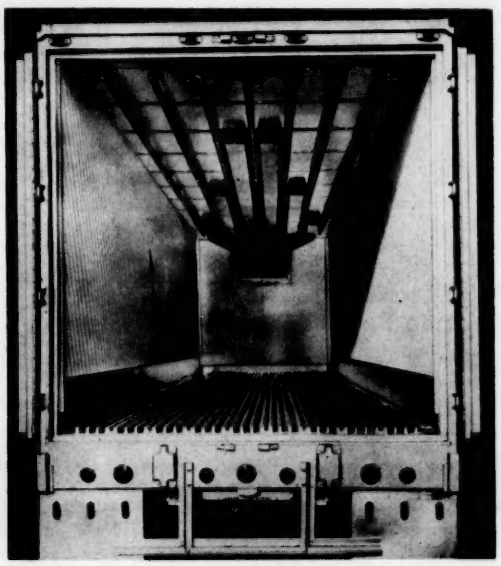


The machine is supplied as an integrated unit, including the pushbutton start-stop mechanism and complete electronic controls for automatic operation. It needs only be connected to its air conditioning system and source of electrical power. The machine is operated from its attractive console nerve center. Once it has been put into operation by the start-stop button, it adjusts automatically to the refrigeration load, maintaining exactly the required chilled water temperature.

A precision assembly of prewhirl vanes regulates the flow of refrigerant gas into the two high-speed rotors of the compressor. Hydraulically operated under electronic control, the prewhirl vanes adjust cooling output. The vanes remain closed until the motor has reached normal speed. This no-load starting feature plus a unique method of reducing current inrush on start-up, results in a lower demand charge and lower operating cost, according to Charles V. Fenn, Carrier vice-president. The new Carrier hermetic design.

New Truck Unit Features Corrugated Plastic Interior

FRUEHAUF Trailer Company of Detroit, Michigan, has delivered their first Deluxe model of a quantity of recently engineered Volume *Van Reefers, incorporating the Fruehauf-Hasko-Struct corrugated plastic insulated sandwich panels. This new trailer was put into operation by the Pacific Intermountain Express, after being displayed late in January at the Frozen Food National Convention in New York City.

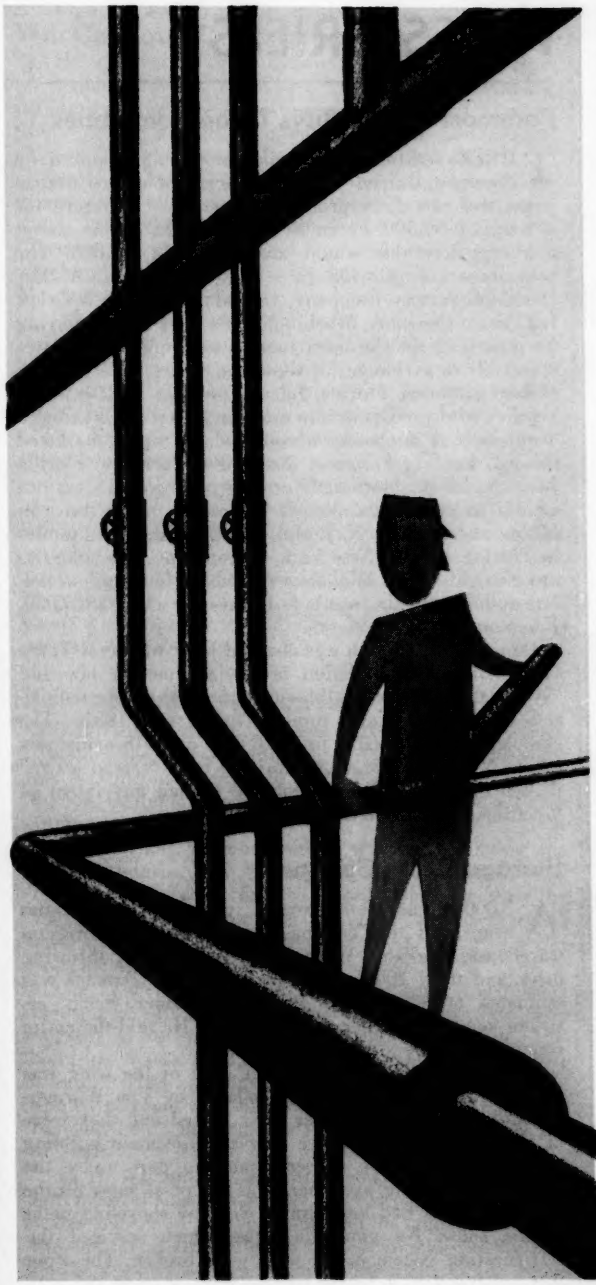


Interior View of New Truck Unit Showing Corrugated Plastic Insulated Sides

The plastic insulated sandwich construction, developed by the Haskelite Manufacturing Corporation of Grand Rapids, introduces plastics, aluminum and plywood into a completely insulated structural unit.

Due to the completely sealed plastic surfaces and specially designed joints of the Styrofoam core construction, the Deluxe unit will not absorb moisture with its resulting loss in insulation value and increase in dead weight. In extreme operating conditions, refrigerated vans have previously picked up as much as 1,000 pounds of moisture, which not only adds to the cost of operating the unit, but requires an expensive and time-consuming operation to remove.

Other major features of the Deluxe model include special front wall panels with the plastic impregnated Fiberglass bonded to hardwood plywood and expanded polystyrene for resistance to heavy impact and abuse; side wall panels with 60 degree corrugations serving as air ducts to induce circulation throughout the trailer and insuring complete temperature control; one piece bonded plastic doors of Hasko-Struct providing durable, waterproof, temperature sealed units.



Flexible pipe insulation goes on fast, requires no vapor barrier finish

New Armaflex® pipe insulation stops condensation, increases efficiency of lines at 32° to 200° F. Closed cellular structure positively seals out water and vapor. Installed in one fast, easy step, Armaflex can be slipped on pipes or tubing, or slit and cemented. Flexible Armaflex follows contours of formed tubing without any cutting or fitting. It resists most solvents, oils, and corrosive chemicals and is self-extinguishing. Made 6′ long, ⅜″ and ½″ thick, for ⅜″ to 3⅛″ ID tubing and pipe.

Armaflex is one of the quality products in the complete line of Armstrong Industrial Insulations. Armstrong also offers you a complete contracting service, geared to install these products economically and efficiently.

For complete information on Armaflex, send for free booklet. Booklets on other Armstrong Insulations also supplied on request. Check the ones you want on the coupon below.

Armstrong

INDUSTRIAL INSULATIONS

☐ Armstrong Armaflex, flexible foamed plastic pipe insulation

☐ Armstrong Armaglas* Insulations for low-temperature rooms

☐ Armstrong Insulcolor®, weatherproof coating in seven colors

☐ Armstrong LT Cork Covering, a new type cold line insulation.

Armstrong Cork Company
2004 Skye Ave.
Lancaster, Penna.

Please send me the free booklets checked. ☐

Please have an Armstrong representative call. ☐

Name .....

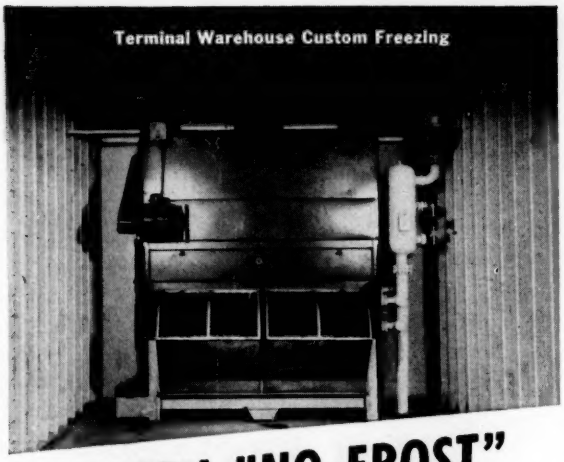
Position .....

Company .....

Address .....

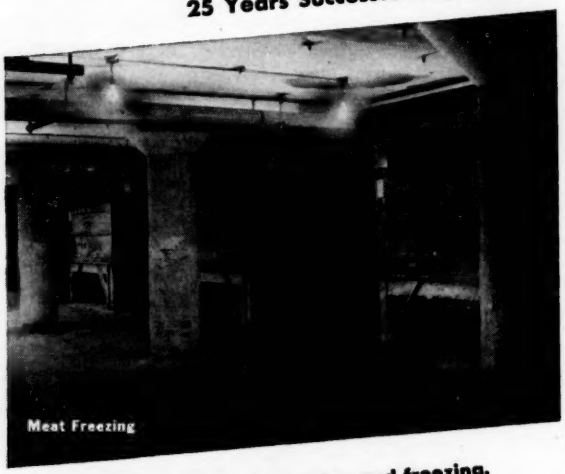
City ..... Zone .... State .....

*TRADE-MARK



NIAGARA "NO FROST"

25 Years' Successful Experience



★ Always full capacity refrigeration and freezing.
★ "No Frost" removes moisture as fast as it condenses.
★ Save power, reduce costs; protect frozen food quality.

Write for Niagara Bulletin 105

NIAGARA BLOWER COMPANY

Dept. IR, 405 Lexington Ave. New York 17, N. Y.

District Engineers in Principal Cities of U. S. and Canada

PRESS BRIEFS

Foremost Dairies Buys Three Companies

THREE additional companies are being acquired by Foremost Dairies Inc. — a packer of chilled orange juice, and two dairy products concerns — in return for a total of 90,500 Foremost common shares. At recent market prices this would amount to $1,700,000. The companies are: Florida Juice Inc., Miami; H. A. McDonald Creamery Company, Detroit; and Jones & Griest Ice Cream Company, Washington, Pa. Foremost is buying its own stock in the open market to acquire the shares it intends to exchange for these companies.

Acquisition of Florida Juice, Foremost said, initiates a policy of diversifying into non-dairy food fields through acquisition of companies whose products can be marketed through existing Foremost distribution facilities. Florida Juice packs single-strength orange juice sold in cartons similar to milk containers. It has processing facilities in Miami and Newark, N. J. and distributes the juice mostly in Florida and the New York metropolitan area. Its sales are currently at an annual rate of about four million dollars and annual earnings before taxes are about $225,000, Foremost said.

Foremost last month was charged by the Federal Trade Commission with violation of the anti-merger law and "systematic elimination of competitors through acquisition of 39 other dairy produce firms since 1951." The complaint is answerable to the F T C and a hearing was set for March 27. Foremost attorneys have "categorically" denied that the company violated, or had any intent of violating, the Clayton anti-merger act.

Storage Room Collapses

A 3,000 square foot storage room of the Ahtanum branch of the Yakima Fruit Growers Association warehouses, Yakima, Wash. collapsed recently, throwing brick and snow 100 feet in every direction. Damage was estimated at $40,000 by Paul VanWormer, Selah, assistant general manager of the concern. He said the entire room would have to be rebuilt.

Weight of snow on the sloping roof of the wing was discounted as a cause for the collapse by Van Wormer. He said it was possible that snow melted and then froze in a joint of the warehouse roof and the main building wall. This may have caused beams to part under the stress of expanding ice. There was a foot of snow on the roof. Workmen had kept drains clear by shoveling paths in the snow. No ammonia pipes which serviced the refrigerating system in the wing were broken. The wing that collapsed is a fourth of the plant storage space.

New Refrigerated Warehouse in Houston

CONSTRUCTION is under way on a new cold storage plant at Houston, Texas for the Houston Central Warehouse & Cold Storage Company. To be of one-story concrete construction, the building will contain approximately 62,500 square feet of floor space. Ceilings will be 21 feet. The building will be equipped with modern automatic handling machinery and labor-saving devices.

Temperature ranges will be from 32 F to minus 10 F. A front concrete loading platform to accommodate 15 trailer trucks will be provided with 25,000 square feet of paved approaches for easy truck maneuvering. Parking facilities under the building for cars and trucks will be provided.

Illinois Ice Plant Liquidated Will Continue Cold Storage

THE commercial manufacture of ice in Champaign-Urbana, Illinois, came to a halt March 14, with the withdrawal from the ice business of Smith & Company, 811 N. State St., after 58 years. The ice making machinery in the plant will be dismantled and sold.

Harold T. Smith, president of the company, expects to remain in business, however, operating the warehouse which has 250,000 cubic feet of cold storage capacity. Whether it will be operated for cold storage or other warehouse uses remains to be determined according to Mr. Smith. Don Weeks, who has been a Smith sub-dealer in Urbana will continue to serve local hospitals and railroads with ice obtained from Danville and also will have a coin operated ice dispensing machine at 211 North Broadway. A Mattoon ice company is also interested in establishing coin operated dispensing machines.

The Smith Ice Company has had the field to itself since liquidation seven years ago of the Twin City Ice and Cold Storage Company. When it closed, the company had about 300 regular customers and operated six delivery routes. In 1930 18 delivery routes were being operated.

The business was founded in 1898 by Harold's father, Thomas Smith, who operated a meat market. The present plant, with capacity of 120 tons of ice daily, was constructed in 1915.

Hotels Expand Air Conditioning

THE Palmer House, Chicago, has started a 1¼ million dollar air conditioning project which by summer will include more than 1,735 air conditioned rooms, Vernon Herndon, general manager, announced. Carrier equipment will be used.

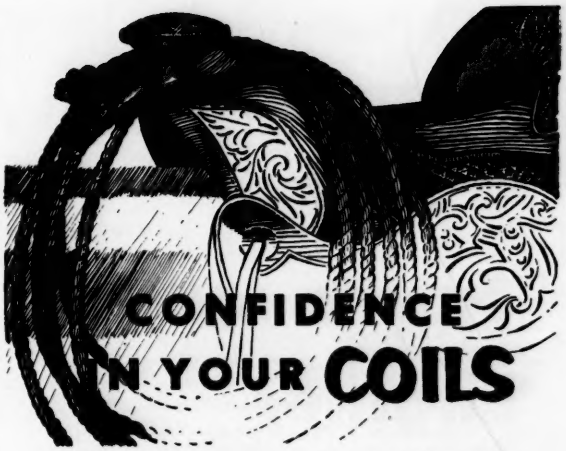
A $2,700,00 air-conditioning program involving the Waldorf-Astoria, New Yorker and Statler Hotels in New York City was announced at a press conference in the Statler. All 2,200 rooms in this hotel are expected to have air conditioning by the end of this year. Carrier equipment will be used in this installation.

The Palmer House project includes guest and display rooms and will require a crew of about 200 craftsmen working at top speed to meet the summer deadline. This hotel has a total of 2,250 rooms. All public and private dining rooms, 22,000 square feet of exhibit space, the grand ballroom and foyer, and corridors on all public function floors have been air conditioned for a number of years.

C. D. Willingham, building supervisor, said the project involves installation of new larger equipment. A 1,250 horsepower compressor will be added to handle the additional air cooling load. A penthouse will be built on the 24-story building to house the air handling equipment. A large cooling tower also will be erected on the roof to service the condenser water load. All York equipment will be used.

Berry Processing Plant Sold

THE former Cedargreen berry processing plant at North Puyallup, Wash. has been sold to Andrew and Joseph Vraves, prominent berry growers and processors near Puyallup. They will operate the plant jointly under the name The Puyallup and Sumner Sales Corporation. The firm's prime interest will be the promotion of fresh market berry sales. The name is the one under which the Vraves brothers last summer conducted business of the fresh marketing committee of the Puyallup Valley Berry Growers Association.



When it's a question of new refrigeration coils, it's no time to speculate on dependability or to compromise on quality. And where it's a question of assuring efficient, uninterrupted operation and low maintenance throughout the years —

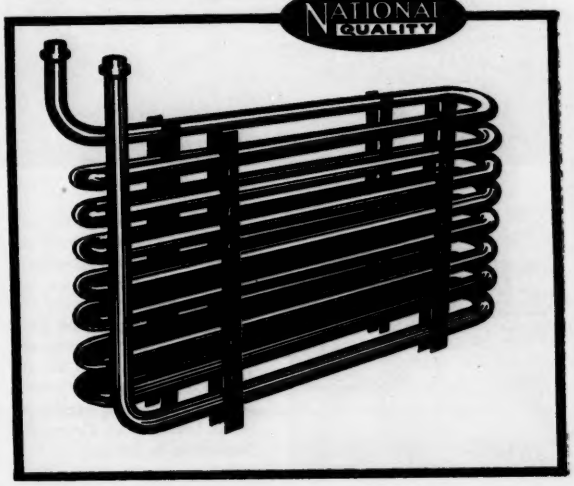
NATIONAL
REFRIGERATION COILS

offer you the benefits of over 70 years' specialization in the pipe-bending field: experienced engineering and exact production, with smooth bends, perfect welds, and accurate measurements.

Whenever you need coils, write for our free tracing-chart which shows standard dimensions ready to fill in. It will simplify your specifications—whether for zig-zag or nested box or conical or round-flat or reducing coils.

NATIONAL PIPE BENDING COMPANY
162 RIVER STREET • NEW HAVEN, CONN.

Established 1883

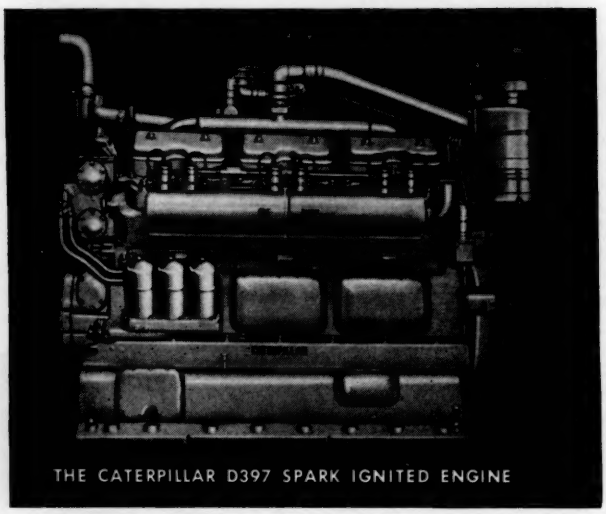


Announcing 2 CAT* Spark Ignited Engines

D397
400 HP
@ 1200 RPM

D375
267 HP
@ 1200 RPM

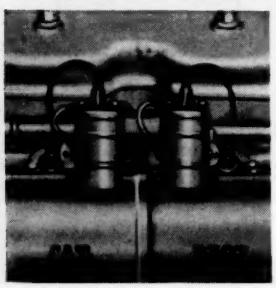
10:1 COMPRESSION RATIO for economical operation
SPARK COIL AT EACH CYLINDER for hotter spark, greater efficiency
LOW-TENSION MAGNETO for long, trouble-free life
MODERN HEAVY-DUTY DESIGN
PLUS OTHER ADVANCE-DESIGN FEATURES!



THE CATERPILLAR D397 SPARK IGNITED ENGINE

Developed to set new standards of efficiency and economy using low-cost natural gas, the D397 and D375 Spark Ignited Engines are the most recent additions to Caterpillar's line-up of modern, heavy-duty units. Wherever you put them to work, you can count on maximum performance with minimum maintenance. Conversion units are also available for diesels. Your Caterpillar Dealer, who backs you with prompt service anywhere and any time, will be glad to give you complete facts about this new power pair. See him today!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.



A separate spark coil for each cylinder, featured in both the D397 and D375, provides a hotter spark for greater efficiency and permits the use of a low-tension magneto for long, trouble-free life. Advance-design features like this are the result of Caterpillar research and practical field experience—an example of Caterpillar leadership in action!

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

MODERN HEAVY-DUTY SPARK IGNITED ENGINES

In the Spotlight

EXPERIENCED Operating engineers won't read anything new in "Human Element Big Cause of Compressor Failures" by Earl M. Kemmler on page 13. Most important to these engineers, however, is the emphasis placed on human failures. Mr. Kemmler's article is intended to refresh memories and alert the practical man to the fact that conscientious and competent knowledge and practices combined with experience, result in most efficient and safe operating. And, to be sure, the completely automatic plan still lacks this intellect capable of correcting human errors. Be the plant automatic or manually operated, the person or persons responsible for its operation, should review their practices periodically. This article from The Locomotive should be a part of every engineer's operating manual, and used as a mental spring tonic. Recommended reading for owner and engineer alike, this article is considered by the editor to be among the best in recent years on operating failures.

A HOLDING company has been organized to operate a plant for orange concentrate marketed under the Stokely Honor Brand. The new company, Citrus, Inc., ships frozen orange juice all over the world. In its first year of operation the plant produced 800,000 cases of 24 six-ounce cans, and now plans have been started to double the capacity. For additional details see story and pictures on page 19.

LOW TEMPERATURES for treatment of metals have become very important during the last fifteen years, — a topic that no metal-worker can afford to ignore. It not only enables proper working of metals but also improves product quality and reduces the cost of processes. See article starting on page 20.

ITEMS IN NAPRE's Question Box often lead to full-fledged discussions. Question No. 1085, page 43, Jan. 1956, on the "flooding" of an NH_3 system purger has prompted a presentation by Robt. T. Brizzolara. This engineer believes the filling-up of the purger with liquid was the result of excessive condenser pressure. In this article (on page 30) based on personal tests, experience and theory, he contends that foul gas is reabsorbed in the NH_3. This phenomena, plus unavoidable impurities in the NH_3 at delivery or developed in the operating system, will not only account for sub-normal compressor performance, but may also explain flash fires which often follow high-side breaks. He suggests that it may be worthwhile looking into low pressure type purgers for eliminating non-condensibles.

WHETHER to build and operate their own refrigerated warehousing facilities, as a means of reducing operating costs, has long been an intriguing subject to many frozen food packers. This question was discussed at a special session of "Public vs. Private Warehouse" at the recent frozen food convention, at which F. D. Newell, Jr., President of NARW pointed out some pitfalls of private warehousing which should be of interest to both packers and warehousemen. See page 26 for a summary of his talk.

REFRIGERATORS which will reduce the temperature of helium to minus 452 F have been on the market for several years, in use in laboratories all over the world. It is now possible, by using a magnetic cooling principle, to reach as low as 0.25 degrees above Absolute Zero. This process and the refrigerating equipment required are described in article on page 27.

TRANSPORTING frozen foods into the Arabian Desert has been made into an accomplished fact with the use of two railroad refrigerator cars, equipped with two separate two-stage low temperature refrigerator compressors. The cars are fully insulated and the exterior painted white to reflect heat. They are equipped with two separate refrigerating systems to provide protection against failure of the refrigerating equipment. For details see article starting on page 23.

A CAVE storage has been established near Paris, France for refrigerated storage of produce. It is installed in underground tunnels excavated for chalk mining. Refrigerating equipment has been installed for maintaining desired temperature and humidity conditions thus meeting the demands of a highly fluctuating market. For description see page 22.

NUCLEAR IRRADIATED Food that would render refrigeration a thing of the past isn't just around the corner, according to Dr. Leonard Reiffel, assistant manager of physics at Armour Research Foundation. He said radiation pasteurization —killing most, but not all, the bacteria in fresh foods—is more promising. This requires much less radiation, does not cause deterioration in quality of the food and still lengthens storage life under refrigeration.

NO RUST—

G-W
CORROSION-PROOF
BREAKER-ELEVATOR
GIVES
ALL-CLEAN ICE
ALL THE
TIME

MORE PROFIT
NO RUST = NO WASTE

The Whole Cake is Saleable

Clear, *clean ice* from all of every cake – that's what you count on to keep profits from melting. And more profit is what you get with the G-W Breaker-Elevator – because every part of it is corrosion-proofed.

Breaker and elevator casing, breaker plates, shafting, flights, sprockets are aluminum alloy or stainless steel. Even after this G-W Breaker has been standing idle, ice particles emerge rust-free and usable.

Corrosion-proofing isn't the only feature of the G-W Breaker-Elevator that was planned with your profit in mind. Snow ice and fines are reduced to a minimum because the *curved picks* strike the cake at right angles, imitating the slicing feed action of hand shaving. Particles are passed without additional crushing through the *comb plate* because the *breaker drum* is ribbed. Flow is steady, discharge is even because drop is minimized and *elevator flights* are close-spaced. A single motor drives both breaker and elevator.

Stop profit-loss where it can be biggest – in your ice breaker. Any G-W representative can tell you about this new profit-building, corrosion-proof breaker, and recommend a unit size to fit your exact needs.

GIFFORD-WOOD CO.

Since 1814
Hudson, N. Y.

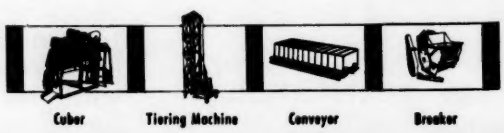
New York 17, N.Y. 420 Lexington Ave. | St. Louis 1, Mo. Railway Exchange Bldg. | Chicago 6, Ill. 565 W. Washington St.

Pacific Coast Representative: WESTERN ICE EQUIPMENT CO., 420 Market St., San Francisco 11, Calif.

1447

SPECIFICATIONS

BREAKER	ELEVATOR
Stainless Clad Steel Plates	Aluminum Alloy Casing
Metallized Rustless Drum	Aluminum Alloy Flights
Chrome-Plated Picks	Stainless Steel Shafting
Chrome-Plated Bolts	Stainless Steel Sprockets
Shear Pin Protected Hubs	Chrome-Plated Steel Chain



Cuber | Tiering Machine | Conveyor | Breaker

HEADQUARTERS FOR ICE HANDLING, CUBING AND SIZING MACHINES ARE

Midtown Toledo explosion and fire in Beegle Meats Div., Hygrade Food Products Co., meat packing plant killed three men and injured two others, and caused property damage in a three-block area. First reports stated refrigerant was responsible for blast, but investigation disclosed gas was the cause.

Human Element Big Cause of Compressor Failures

EARL J. KEMMLER

Ass't Chief Engineer

Machinery Division

Hartford Steam Boiler Inspection and Insurance Company

From "The Locomotive" Publication

AMMONIA was the first successful commercial refrigerant, and, today, because of its availability, cost and characteristics, it is widely used in commercial refrigeration.

The compressors have evolved from lumbering, steam-driven machines to today's light, compact, high speed, motor-driven units. After many years of being manufactured, more experience has been gained with this type of compressor than any other type of refrigeration compressor in common use. However, these machines are still subject to somewhat the same types of failures that were prevalent twenty or thirty years ago.

When an ammonia compressor insured by the Company fails, an inspector is promptly dispatched to the scene. Whenever possible, he arranges to arrive before repairs commence, and is thus able to examine the damaged parts before they are discarded or repaired. By his examination of the parts and of the events leading up to the failure, he attempts to determine both the direct and indirect causes of failure. In a continuing effort to determine and eliminate the causes of accidents, the Company's engineering staff reviews these reports written by Inspectors.

Analysis of Failures

The following is an analysis of approximately 500 ammonia compressor failures investigated by The Hartford Steam Boiler Inspection and Insurance Company during recent years:

Based on some 500 ammonia compressor failures investigated by the Hartford Steam Boiler Inspection and Insurance Co. over 53 percent were directly or indirectly due to human error. A regular preventative maintenance program which INDUSTRIAL REFRIGERATION continuously encourages through its editorial columns, could reduce this substantial loss. The Operating Engineer has a responsibility in selling Management on the economies of this program.

Initially Damaged parts	Percent
Valves	33.3
Bearings	21.0
Shafts	14.3
Fastening Devices	10.7
Pistons or Cylinders	8.3
Piston or Connecting Rods	4.0
Piston Rings	2.7
Oil Pumps	1.6
All Others	4.1

Direct causes of failure	Percent
Progressive Crack or Fatigue	30.0
Dirty, low or unsuitable oil	20.6
Slugging by liquid ammonia	15.5
Loosening of Parts	6.8
Excessive Wear	5.6
Misalignment	5.5
Material or Design Defects	4.6
Faulty Repairs	3.4
Faulty Adjustment	3.0
All Others	5.0

In some of the failures, alert operators were able to detect signs of trouble and shut down the machines quickly enough to limit damage to the initial part that failed such as a valve, bearing, piston ring, etc. In many other cases involving unattended or intermittently attended machines, however, damage continued before the compressors could be shut down and resulted in severe failures which often required repairs totaling thousands of dollars.

Causes

The study indicates that all of the direct causes of failures fall into 17 categories, with nine of them accounting for 95 percent of all failures, and eight account for remaining 5 percent.

While the listing shows only the direct causes of failures, a more detailed analysis indicated that over 53 percent of all the failures studied were due either directly or indirectly to human error manifesting itself in either improper operation, repairs, or adjustment; lack of knowledge, or lack of attention, or maintenance. These underlying causes include: failure to maintain an adequate or clean supply of proper lubricating oil, failure to maintain valves, improper starting, and improper operation of shut-off valves in both the jacket cooling water system and the lubricating oil system.

Valves

Valves failed initially in over 33 percent of the cases, indicating the advisability of taking precautions to reduce failures of valves. The operating valves in ammonia compressors are of two general classes: The poppet type having a cushioning or dashpot action, and the ring plate or strip type (either flexing or straight lift). The poppet valve was most generally encountered in the rather heavy, slow speed compressors. Today, the ring plate and strip valves are almost universally used in the medium and high speed (up to 1200 rpm) compressors in which speed and inertia demand light weight and very low-lift valves.

Stress and Fatigue

In some modern, high-speed compressors, valve parts are required to withstand over 300 million stress reversals within a year, even if the compressor is in service only 50 percent of the time. Obviously, the best alloy steel may be expected to show some signs of stress and wear after such service, and for this reason most manufacturers recommend that valves be inspected at maximum intervals of one year. Barring other reasons such as failures resulting from material defects or liquid ammonia slugging, the failure of a valve which has been in service for a longer period without inspection may be attributed to fatigue, and lack of maintenance.

Slugging

Other than fatigue, the most frequent direct cause of valve trouble has been found to be the return of liquid ammonia to the suction side of the compressor with consequent "slugging" of the valves. While most compressors will handle a little "wet" gas without too much difficulty, they are designed to be gas compressors and cannot be expected to pump liquid ammonia without incurring broken valves and other parts.

The return of liquid ammonia requires that a valve, which may have already been somewhat fatigued by millions of stress reversals and by previous small amounts of liquid ammonia, suddenly handle a practically imcompressible fluid. The safety heads are designed to lift and give a greater escape area for any liquid ammonia entering the cylinder, and will, in most cases, prevent the destruction of the cylinder and piston, but often do not lift quickly enough to save the valves.

Improper Starting

One condition which often results in the "slugging" of a compressor with liquid ammonia is improper starting, especially when a pump-down cycle is not provided and after a long shutdown. Most manufacturers provide proper instructions for starting their compressors. They should be followed religiously.

After a shutdown, the compressor should be started by opening wide the valve in the discharge line and, after proper operation of by-pass valves, just "cracking" open the valve in the suction line until the suction pressure has dropped to about 20 psi. Many valves have been broken on start-ups because the suction valves were immediately opened wide, allowing liquid ammonia which had collected in the suction lines, for one reason or another, to be entrained by the sudden rapid flow of gas and carried into the compressors. Starting with the suction valve barely open restricts the rate of flow until the desired suction pressure has been obtained and most of the liquid ammonia in the suction line has been evaporated.

Another cause of "slugging" is the use of expansion or float valves which are of improper size or adjustment. If an expansion or float valve is too large or opened too wide, the heat load of the evaporator will permit an excessive amount of liquid ammonia to flow into the evaporator with possibly low and inefficient suction pressures, causing liquid carry-over into the suction line. When excessive frosting-back or extremely low suction pressure occurs, the setting and condition of the expansion or float valves should be promptly checked and corrected. Frosting is permissible on the

Ammonia Not Cause of Blast

FIRST reported as an explosion due to "leaking gas from a cooling system", subsequent investigation by city inspectors of Toledo, Ohio investigating the blast that killed three men and injured two others in the plant of the Beegle Meats Division of the Hygrade Food Products Co., have placed the blame on a rust corroded section of piping that carried gas from a main into the plant.

After digging five days with a city crane, crewmen located an ammonia compressor in the basement of the demolished building. The compressor had been used to refrigerate the large cooler room where the explosion was set off as an employee flicked a cigarette lighter.

In spite of the tremendous concussion that rocked a 4-block area of downtown Toledo, and the fact that the compressor had been buried under debris of a 3-story building, the compressor showed no leaks or breakage.

suction piping leading back to the compressor, but when it extends very far on the lower part of the compressor cylinders there is a distinct possibility that liquid ammonia is being drawn into the compressor.

Even when expansion or float valves are of the proper size and adjustment and the system is properly charged, some liquid ammonia may at times be entrained in the suction gas stream. This is especially possible during sudden heat load increases, and may be indicated by excessive frosting of the suction lines.

Liquid Trap

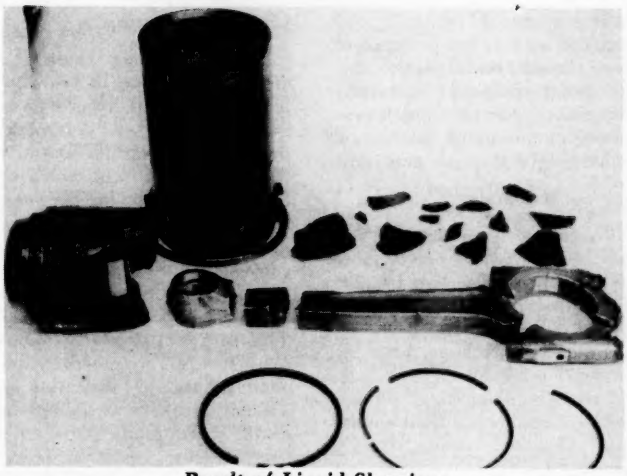
In many cases it is necessary to install either a liquid ammonia trap or an accumulator in the suction line of the compressor to trap the liquid, or to even provide a heat exchanger in the suction line to evaporate the liquid ammonia. Such a heat exchanger uses hot liquid ammonia discharged from the receiver to the expansion valve as a heating medium. The heat exchanger will also cool and increase the heat absorbing capacity of ammonia expanding in the evaporator. In any case, the expansion or float valves should be so adjusted to maintain a superheat of at least five degrees at the suction side of the compressor. But if low temperature requirements or other conditions prevent this a small amount of the hot discharge gas may be by-passed to the suction line a few feet from the compressor.

Another frequently occurring cause of valve troubles is overheating resulting from excessive head pressures or recompression. Excessive carbonization of lubricating oil at the valves may also cause valve leakage.

Watch Head Pressure

With a clean condenser of proper size and an ample flow of cooling water at 85 F, it should be possible to maintain head pressures at about 190 psi. Lower pressures should be obtainable with cooler water. Excessively high head pressures may be due to a condenser being too small for the system, a condenser having dirty or clogged water sides, an insufficient supply of condenser cooling water, or scaled compressor water jackets. Of course, high head pressures may also be caused by other conditions such as the presence of non-condensable gases in the system or an overcharge of ammonia. These latter conditions can be corrected after being determined by tests.

Whenever valve strips or ring plates are found to be cracked, it should be standard practice to replace all rings or strips in that valve. They are very likely to be of similar age and condition, and probably have been weakened by the high temperature resulting from recompression or other conditions. The economy of risking a machine worth several thousand dollars in order to save the comparatively low cost of replacing all ring plates or strips in the defective valve is certainly doubtful.



Result of Liquid Slugging.

Another protection against valve damage is the use of suction scale traps which are usually mounted on the compressor. Even with the best control conditions, it is very difficult to thoroughly clean every pipe and fitting of all mill scale and dirt. When the ammonia system is placed in operation this foreign material will often break loose from the pipe walls and collect in the scale trap. Therefore, the trap should be cleaned after the first week of operation of a new system and at least once a year thereafter.

Bearings, Lubricating Oil and Oil Pumps

The usual causes of the second most frequent type of accidents bearing failures are unsuitable and insufficient lubrication.

Unsuitable oils are those which are contaminated, of an inferior quality, or of an improper type. Only oils recommended by either the manufacturer of the compressor or by a reputable oil company consultant should be used in ammonia compressors. Manufacturers of ammonia compressors will, upon request, advise as to the type of oil best suited to the compressor and to conditions of the system. Only a pure mineral oil should be used as ammonia has a caustic effect on animal and vegetable oils and will cause soap and sludge to be formed, which may not only clog the oil system and cause bearing burnouts, but may also cause sticky valves and piston rings.

Two other necessary characteristics of good ammonia oils are high-flash and low-congealing temperatures. The oil must be sufficiently fluid to provide good lubrication, but stable enough not to vaporize at temperatures experienced. In addition, it should remain fluid at low temperatures in order to prevent the stopping up of expansion valves. The flash and congealing temperatures of most ammonia oils rise and fall together. Consequently, experienced, technical judgment is necessary in choosing the correct oil. In some very low temperature systems the required low-congealing-temperature oil may have a flashpoint only slightly higher than 300 F., while discharge temperatures may be approximately 250 F. Therefore, even though the oil may not flash the high operating temperature will cause some decomposition of the oil. The presence of ammonia, water or other impurities in the oil will hasten such decomposition.

Oil Sludging

Even when an oil has all the desired characteristics, sludging may be caused by the presence of water. Moisture enters the system with air whenever the compressor is opened for inspection or repair, or with air leaks through an external lubricator. Being hygroscopic, ammonia may retain some moisture even after attempts to purge the system of air. A small amount of lubricating oil is always circulated through the system with the ammonia and will be emulsified by contact with moisture. This will impair the lubricating qualities of the oil, and cause the formation of

sludge. If a proper oil is being used and sludging occurs, the presence of moisture should be strongly suspected, and necessary corrective measures taken promptly, which may even entail pumping out the system and recharging with fresh ammonia.

Excessive Clearances

Insufficient lubrication at the bearings may be the result of one or more conditions such as excessive bearing clearances or worn bearings, defective or worn oil pumps or rings, low oil level in the crankcase, dirty or sludged lubricating oil causing jamming of rings or plugging of piping, or excessive amounts of liquid ammonia in the crankcase causing priming and foaming. The latter condition can also cause excessive amounts of oil to be carried over into the system.

The oil in the crankcase of a new compressor should be changed after the first week of operation, again after about two months of operation, and thereafter as necessary—but at least each year. Some manufacturers recommend that the oil in modern high-speed machines be changed every two to three months. The manufacturer's recommendation should be carefully heeded. The filters and strainers should be cleaned whenever the oil is changed and at intervals of from three to four months, or oftener.

Worn Bearings Dangerous

Permitting an ammonia compressor to operate with excessively worn bearings is foolhardy and dangerous. Even a momentary stoppage or reduction in the supply of oil which would probably not seriously affect a good bearing, may cause a worn bearing to burn out. Such burnouts often cause scoring of bearing journals, and sometimes require that the shaft or pin be replaced, or, at the very least, that the compressor be taken out of service when most needed. Excessive clearances caused by serious wear at one bearing can cause large oil-pressure drops across the bearing, and cause others to become oil starved and to burn out. The misalignment condition initiated by seriously worn bearings frequently results in the fatiguing and breaking of the shaft, pins, or connecting rods.

All bearings in an ammonia compressor should be thoroughly inspected for damage after every occasion of lubricating oil difficulty. In addition, they should be inspected and cleaned every time the oil is changed. It should be remembered that a bearing is a wearing part and not expected to operate for extended periods without inspection and attention.

Check Oil Pump

Another common cause of insufficient supply of oil to bearings is defective oil pumps. In every case analyzed, when it was determined that the oil pump was the initial part to fail it was also determined that the direct cause of the failure was a wearing of either a pump bearing or of the pump itself. Worn pump bearings can cause misalignment of the pump parts to such a degree that oil can not be pumped in either sufficient quantities or pressures. In several cases such misalignment caused complete stoppage of lubrication and consequent breakage of pump shafts or gears. Worn pump parts other than bearings also result in reduced oil flow and pressure. It is well indicated, therefore, that oil pumps should be inspected whenever possible, and certainly each time the bearings are checked.

One method of preventing damage from low oil pressure, whether caused by a defective oil pump, worn bearings or clogged oil lines, is to install a cut-out to shut down the compressor in the event oil pressure drops below a pre-determined minimum. The cut-out should be activated by the oil pressure at the main bearing located most distant from the oil pump discharge. Such devices are desirable on all compressors equipped with pressure oiling systems, especially those that are unattended or that are checked only at intervals, as low oil pressure can cause serious damage in a matter of minutes.

Bearings failures resulting directly from any of the foregoing conditions can almost always be traced to one of the underlying causes stated in this article: improper operation, improper repairs or adjustment, lack of knowledge, or lack of attention or maintenance.

Shafts and Rods

While damaged crankshafts, pistons, or connecting rods were found in a high percentage of cases, only slightly more than 18% of the failures studied actually originated in one of these parts, which either deformed or broke.

The breaking of a crankshaft, piston rod, or connecting rod is a serious failure because it usually causes extensive damage to other parts of the compressor, and it can almost invariably be traced to one or more of the following: misalignment, shock load (such as caused by bearing or piston seizure, or liquid in the cylinders) or improper repairs. In only a very few cases failure resulted from defective material or design.

Alignment Important

Misalignment, probably the greatest single cause of broken shafts and rods, resulted in most cases from improperly fitted or excessively worn bearings which caused excessive bending stresses in the shafts or rods. Since misalignment is a condition which becomes progressively worse, the only way to prevent breakage is to detect and correct the condition early.

In common use today for checking the alignment of crankshafts is the H.S.B. straingauge. This instrument is essentially a dial micrometer equipped with extension rods to allow mounting between the webs of a crank. So placed, it will measure the total deflection of the webs during one revolution of the crankshaft. With the reading obtained it is possible to calculate the apparent fiber stress existing in the crank webs and crankpin. Company inspectors are provided with straingauges and are qualified in both the use and in the interpretation of the readings obtained. The instrument may be used in most reciprocating ammonia compressors except the smallest ones or those in which the crankshaft design does not permit its insertion.

In the larger machines, misalignment may also be caused by a poor or settling foundation or by deteriorated grouting. These conditions can usually be detected by a visual inspection and by the use of an engine level.

Correcting Crankshaft Stress

The crankshaft may also be excessively stressed by misalignment between the compressor and its driving machine, by heavy overhung flywheels or by overly tight belts. These conditions can be detected and can be corrected by methods known to competent mechanics or servicemen. Of all the studied cases in which improper repairs caused the breaking of rods or crankshafts it was found that the parts had been fusion welded. The repairs had consisted of building up scored or worn journals, scored packing gland areas; areas under flywheels; or of repairing cracks and casting or forging defects in shafts or rods. The parts so repaired failed in either the welded or adjacent areas. The Company's experience shows that when such machine parts are fusion welded, even if done under the most closely controlled conditions, they will eventually fail. The elimination of this type of failure is simple—no fusion welded repairs should be made to these parts.

Fastening Devices

This group includes such parts as nuts, lock nuts, cotter keys, clip rings, connecting rod and bearing bolts, set screws, and keys. While actual failures of those devices accounted for only 6.7 percent of the cases studied, their having become loose contributed to many more failures. The main causes for failures in this group were found to be: wear, improper repair, improper adjustment, and material defects. Improper repairs included the use of undersize cotter keys, worn or overstressed bolts and nuts, improperly fitted keys, and the *reuse* of cotter keys or "one time" lock nuts and lock washers. It may appear to be economical to reuse such devices, but it is false economy. A loose clip ring may allow a piston pin to move out and strike the casing, while a broken cotter key may permit a nut to back off. Either can result in a broken connecting rod and probably more serious damage.

In some failures that causes were found to have started with improper adjustment. Loose fastening devices allowed play, while those which were too tight became overstressed. These conditions are easily prevented.

In only a very few cases were failures of fastening devices found to have been caused by material defects. Nevertheless, any such part to be used in the repair or reassembly of a compressor should be checked for defects.

Pistons, Piston Rings and Cylinders

These parts failed initially in approximately 50 of the 500 cases analyzed and included broken or cracked rings, cylinders, and pistons; in addition to scored cylinders and pistons.

Most of the piston ring failures resulted from fatigue or excessive wear. Prolonging the service of piston rings not only invites failures but also causes blow-by of hot gases and general inefficiency. Blow-by gases can impair the cylinder wall oil film, while excessively worn oil scraper rings will permit undue amounts of oil to be blown into the ammonia system. Usually the instruction book supplied with the compressor contains the maximum wear permissible.

Cylinders and pistons are very often severely scored or broken by pieces of piston rings jammed into the clearance spaces at the end of the cylinder. A broken ring is a minor failure, but its neglect often leads to a major failure and prolonged outage.

Loss or impairment of the lubricating oil film also results in a wiping or scoring of pistons and cylinder walls, and may be caused by the washing effect of excessive liquid ammonia, from inadequate water jacket cooling, foreign substances such as scale in the system, or lack of lubrication.

The jacket cooling water spaces should be thoroughly cleaned and washed whenever there is any indication of reduced cooling effect. In some areas where the cooling water contains hard scale-forming materials it may be necessary to acid clean the water jackets at intervals under competent supervision. Unattended, automatically-operated compressors located where the cooling water supply may fail should be equipped with cooling-water-failure cutout switches in order to shut down the compressors before damage occurs.

Scored Pistons and Cylinder Walls

Scored pistons and cylinder walls, even if only of a minor nature, should receive proper attention. The cause, particularly, should be investigated, as the condition is probably a progressive one. Lack of attention will result in irreparable damage of the cylinders and pistons, whereas if the scoring is detected early enough, it may often be removed with a minimum effort and expense by honing. As with other parts of the compressor, most of the troubles experienced are primarily due to lack of attention and lack of maintenance.

Conclusion

Ammonia compressors often fail when the need for their continued operation is most necessary. It has been shown that the majority of these failures are due to human error or fault. Thus the safe operation and continuity of service of these machines rests mainly on the efforts of both the operators and service personnel.

Faulty Shaft Discarded

DURING the dismantled inspection of a large ammonia compressor, the inspector, using the penetrant-dye method found a progressive crack extending one-third of the distance around the shaft at the crank web. After further scrutiny, he found that the area had in the past been built up by fusion welding, and then ground down to size. The shaft was discarded. Undoubtedly, had that shaft been continued in use, it would have broken and could have wrecked the entire compressor.

Rupture of Compressor Causes Explosion

GREEN BAY, WISCONSIN — One man was killed in an explosion that injured nine others when the head of an ammonia compressor at a meat-packing concern ruptured, and allowed ammonia fumes to escape and ignite. Glassbrick walls were smashed into jagged missiles, one of which caused the one death reported. A large amount of meat was contaminated by ammonia and debris, and had to be disposed of immediately.

Packaging Containers To Meet Condensation

THE SEARCH for a way to design a container that will protect its contents against condensation when removed from low to high temperature promises to be one of the most valuable research ventures that TRRF has sponsored and aided according to a recent isue of The TRRF Bulletin.

Results From Wood Cases

Dr. J. G. Woodroof of the Georgia Experiment Station reports that some interesting results are coming from work on wood cases containing cans of milk, in cooperation with a large dairy company. He and co-workers have found that, by completely lining the case with polyethylene film, condensation and rusting were prevented when cases were transferred from 32 F and 75 percent relative humidity to 90 F and 90 percent relative humidity. When plain corrugated cartons were similarly lined, the cans were protected but the carton was weakened as a result of condensation outside the moisture barrier (that is the polyethylene).

Commercial manufacturers of containers are being asked to consider these results. The question has arisen whether condensation is a problem to be solved by food manufacturers through better packages or one to be solved by refrigerated warehousemen through control of temperature and humidity. The U. S. Quartermaster Corps is aiding these studies at Georgia Agricultural Experiment Station also.

Warehousemen Prepare for Record Attendance at Annual Meeting

BREAKING past records, attendance at the American Warehousemen's Association 65th Annual Meeting is expected to exceed 800, reported Convention Chairmen Jack Dawson, executive manager of Pacific States Cold Storage Warehousemen's Association, San Francisco, and Morgan Stanley, General Manager of Star Truck & Warehouse Company, Los Angeles. Meeting at the Statler Hotel in Los Angeles, April 9-13, AWA'ers are looking forward to the largest convention in AWA history.

Informal Discussions

This year the emphasis will be on informal discussions. One entire morning will be devoted to a unique "Brainstorm Session," giving each individual a chance to air his particular problems. Legal liability insurance, saving tax dollars, warehouse construction and modernization, costs, safety through color coding, and sales problems are among the subjects tentatively being scheduled.

Meeting jointly will be AWA's two divisions—the National Association of Refrigerated Warehouses and the AWA Merchandise Division. Also, the Refrigeration Research Foundation and NARW will hold a special session to discuss important and new developments in the field of foods irradiation.

Entertainment

A Welcome Party, sponsored by California warehousemen, will open convention festivities Monday night, April 9. Featured on Tuesday evening's social program is a reception followed by an "Aloha" party, which will be strictly informal in line with the Hawaiian theme.

Highlighting AWA social activities, the President's Reception and Dinner will be held Thursday night, April 12. Guided tours have been arranged for those interested in visiting one of the film colony's most famous movie studios and Disneyland. As in previous years, additional social functions are being planned especially for the ladies.

As a grand climax to this 65th annual meeting, many convention delegates and their families will be taking either the post-convention air-cruise to Hawaii or the special AWA train trip through the Feather River Canyon.

Opening Sessions

The convention proper will open Tuesday morning with the opening session of the American Warehousemens' Association at 9:15 a.m. The National Association Refrigerated Warehousemen's Association will open Tuesday afternoon at 1:45 p.m.

TRRF Meetings

Group sessions of the Scientific Advisory Council of The Refrigeration Research Foundation will be held Saturday, April 7, at 10:00 a.m. and 2:00 p.m. The full council will meet Sunday, April 8, at 2:00 p.m. and Monday at 10:00 a.m. The membership meeting will be held Monday afternoon at 2:00 p.m. followed by election of seven new members of the Board of Governors. The Board will then hold a dinner meeting Monday evening, beginning at 6:00 p.m. The new executive committee will meet at breakfast on one of the following days when there is no early morning activity in the NARW sessions.

Council Sessions

All warehousemen, whether Foundation members or not, are invited to attend the Council sessions which bring out many technical details and discussion of technical problems of real interest to the refrigerated warehousemen. Many warehousemen who have attended these sessions in the past, have said that they acquired facts of real practical and monetary value by sitting in on these sessions and participating in them.

Purchases of Frozen Hams and Shoulders

RECENT purchases have been announced by the U. S. Dept. of Agriculture of 150,000 pounds of frozen hams at prices ranging from 47.00 to 47.20 cents per pound; and 225,000 pounds of frozen shoulders at prices ranging from 33.45 to 34.00 cents per pound. Products are for use in school lunch program and institutions and by welfare agencies for needy persons.

Awards announced included three of nine bidders who offered 990,000 pounds of frozen hams, five of five bidders who offered 425,000 pounds of frozen shoulders, and one of eight bidders who offered 1,050,000 pounds of frozen loins.

Pacific Northwest Cold Storage Men Meet

THE annual meeting of the Pacific Northwest Association of Cold Storage Warehousemen was held recently at the Washington Athletic Club in Seattle. The following officers were elected.

President, P. V. Henningsen, Portland.

Vice-president, William L. Baker, Seattle.

Secretary-treasurer, W. Irvine Hunter, Seattle.

Directors: Alan Hoy, Seattle; Bernard Prinsen, Albany, Ore.; Ralph Kenyon, Grandview, Wash.; Miss Elizabeth Nye, Spokane; Fred Plath, Yakima; Alex P. Olsson, Portland; John Harkov, Lynden, Wash.

Association membership is made up of public cold storage warehousemen in Washington, Oregon and Idaho, affiliated with the National Association of Refrigerated Warehouses. The organization meets quarterly to discuss problems of the cold storage industry and to foster the best interests of the industry.

Grade Standards For Frozen Plums

THE U.S. Department of Agriculture has issued, for the first time, U.S. standards for grades of frozen plums. The standards will become effective for use March 6, 1956. This product is generally packed in thirty-pound tins for institutional and manufactural uses. The production of frozen plums has increased rapidly during the last two years.

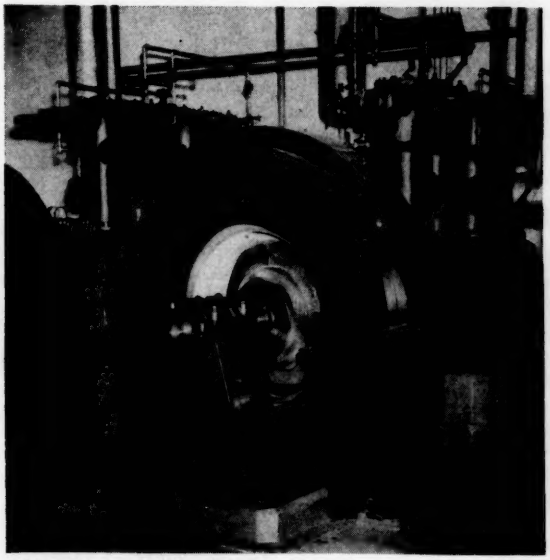
Three separate styles of pack are provided in line with commercial practices designated as "whole pitted," "halved" and "crushed and broken." The grades of the product are designated as U.S. Grade A or U.S. Fancy; U.S. Grade B or U.S. Choice; and Substandard.

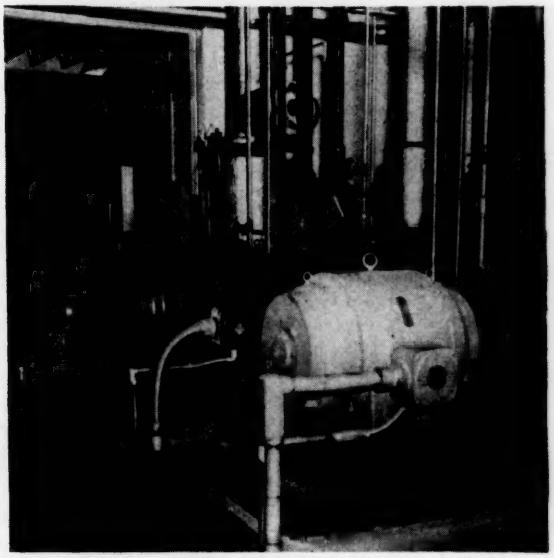
The grade of frozen plums is to be determined by evaluating the factors of color, size, defects, and character and by determining compliance with requirements with respect to varietal characteristics and flavor.

Orange Juice In Storage Increases

THE January build-up in orange concentrate stocks was three million gallons greater than average and two million gallons greater than last year, the United States Department of Agriculture reports. The January gain of seven million gallons raised warehouse stocks to 22 million gallons.

Modern Processing Plant Produces Leading Brands of Frozen Orange Concentrate





This 450 hp Fairbanks-Morse synchronous motor furnishes power for frozen orange concentrate plant of Citrus, Inc., at Haines City, Florida. Right: Fairbanks-Morse QZK's drive refrigeration compressors in Citrus, Inc., plant.

A NEW holding company, Citrus Incorporated, has been organized to build and run the orange concentrate plant which processes frozen juice marketed under the labels of Stokely Honor Brand, Pictsweet and Bordo Products. Prior to the venture, Stokely Van Camp had contracted for its orange concentrate at various independent process plants, and Bordo Products had not sold or packed frozen juice though they had been a leader in single strength juice and sections. Pictsweet, a frozen vegetable firm, had recently been absorbed by Stokely Van Camp.

The new corporation takes its name from still another element in the merger. Suni-Citrus (They Moo For More) had been a leader in the manufacture of feeds and molasses as an end product of concentrate processing. This firm joined with Bordo Products and Stokely Van Camp, and Citrus, Incorporated, came into being.

Location Facilities

In picking a location for any new manufacturing or processing plant, due consideration must be given to basic essentials like raw materials, water, transportation and labor. Polk County grows about twenty-five percent of all the oranges in the tremendous agricultural industry of Florida, so Polk County seemed a good spot for raw material. Haines City is located almost in the center of the County. Hundreds of lakes dot the topography of Central Florida, and the standard ground water level for pumping is about thirty-five feet—no problem at all. The Atlantic Coast Line right of way runs through Haines City, actually within fifty feet of the plant, and there are two national highways, US 27 running north and south and US 92 running east and west. That's plenty of transportation.

Richard Holzcker was elected to build and run the new plant. He built it and he ran it so successfully in its first year of operation (800,000 cases of 24 six-ounce cans) that plans were started immediately to double plant capacity.

Citrus, Incorporated, ships frozen orange juice all over the world. From the groves the fruit is shipped in bulk to weighing platforms and conveyor loaded into bins for storage. From the bins more conveyors take the fruit to the extractors where the juice is separated from the fruit. The juice goes one way and the pulp another. The juice is now pumped through cooling tanks to the concentrators where excess water is removed by evaporation. The concentrate is pumped back through a pasteurizing process to filling machines. The cans are sealed and the canned concentrate is run through a freezing tunnel, cased, and either put in storage or loaded directly on refrigerated trucks or trains.

Cleanliness a Must

As in all food industry, cleanliness is the watchword, and wash-down operations are almost continuous. Since most of the machinery is driven by electric motors, water is very damaging unless proper precautions are taken. There is a standing argument in the industry as to the use of open motors or totally enclosed motors. Open motors get wet, but if they are run continually not too much damage is done. At the end of the season, each motor must be baked out and reinsulated—an expensive operation. Totally enclosed motors tend to collect water from condensation and must be drained. At the end of the season they too must be baked out.

To meet this situation, splashproof motors were installed with special Fairbanks-Morse 17 waterproof insulation. The result has been entirely satisfactory, with no failure due to wet motors. On the larger machines—ten horsepower and up—space heaters are installed to eliminate the moisture problem.

A truck scale weighs the fruit as it enters the plant, and a platform

(*Continued on page* 50)

Low Temperatures for Treatment of Metals Improve Quality and Reduce Costs

THOMAS A. DICKINSON

ALTHOUGH the refrigerator may never rival the furnace as the metal treater's most important asset, subzero treatments have in the past fifteen years become a topic that no metalworker can afford to ignore. This is so not only because low temperatures do some things that high temperatures can't do, but also because extreme cold can improve product quality and reduce the cost of processes which necessitate the use of heat.

With refrigeration facilities that are now commercially available, it is possible to reduce the temperature of a metal component to within a fraction of a degree above absolute zero (or −459° F.). So far, few production processes necessitate the use of temperatures below −150° F. This is at least partly due to the fact that the equipment which is required for ultra-low temperature processing remains relatively expensive to buy and to use. However, there is reason to believe that temperatures in the neighborhood of absolute zero will soon find a number of commercial applications in spite of cost considerations.

For example, recent research at the National Bureau of Standards has shown that ultra-low temperatures can make it possible to use materials like columbium nitride in place of selenium in the construction of rectifiers for alternating current, and allows the use of tin, lead, aluminum, and zinc as "superconductors" of electricity.

Reprinted by permission from Master Craftsman, official Journal of the Metal Treating Institute.

Purposes of Cold Treating

In general, cold treating processes in industrial use at present serve the following purposes:

(1) Dimensional stabilization of precision parts, gages, or master gage blocks.

(2) Improvement of the hardness and wear resistance of gears, pinions, shafts, molds, dies, pump parts, and other components comprising carburized alloy steels.

(3) Prevention of warpage and elimination of cracks due to grinding and machining operations in ball bearing races, hardened steel parts, aluminum alloys, and castings.

(4) Increase in the useful life of drills, reamers, milling cutters, taps, gear bobs, blanking dies, hacksaw blades, and related cutting tools.

(5) Improvement of the properties of materials for permanent magnets.

(6) Rapid seasoning or aging of cast iron.

(7) Retarding the age hardening of certain aluminum alloy components so that they can be formed satisfactorily many hours or days after they have been annealed.

(8) Betterment of the dimensional stability of aluminum and magnesium alloy castings, forgings, and machined parts.

(9) Elimination of the need for double tempering of some high speed steel tools.

(10) Lengthening the cutting life of "off-the-shelf" tools which may not have the exact heat treatment required to bring out their best properties.

(11) Improvement of the accuracy, stability, and freedom from warpage of machine tool components such as precision machine beds and ways or jig borer master screws.

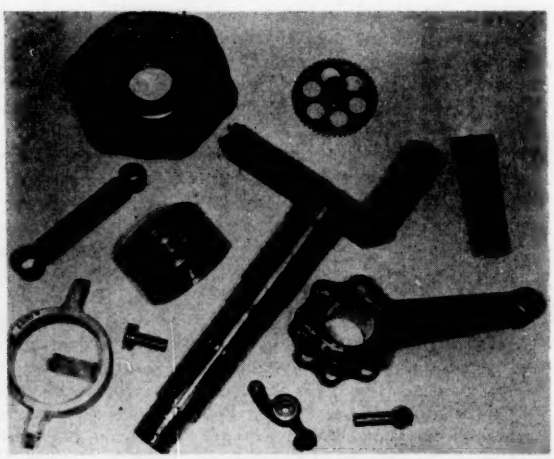
(12) Increase in the strength of welded assemblies (especially by eliminating retained austenite in welds).

(13) The salvaging of expensive out-of-size dies, once they are hardened, by altering their dimensions.

(14) Improvement of the ductility of metals for deep drawing operations.

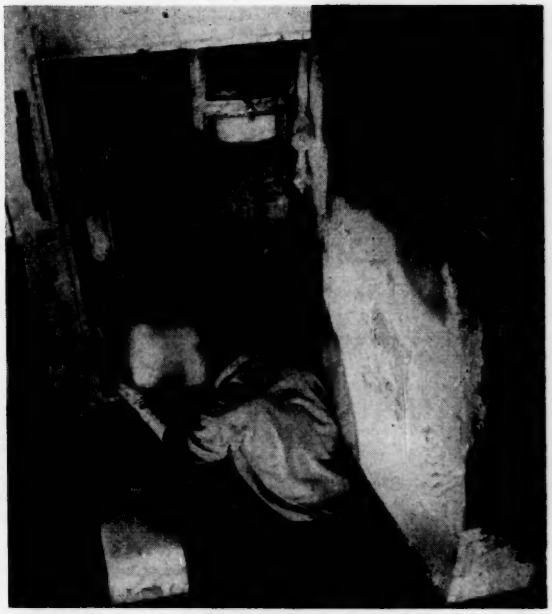
According to a survey that was recently conducted to Bowser Technical Refrigeration Company, less than 20 percent of the plants that have heat treating facilities now have cold treating equipment: yet at least 50 percent of these firms could make effective use of subzero processes. Therefore, it is believed that a review of some of the more important heating and refrigeration techniques is in order at this point.

With an industrial refrigeration unit of the type shown here, temperatures can be reduced from 70 F. to minus 85 F. in only ten minutes.



Cold treatments enable parts comprising carburized alloy gear steels to acquire extra hardness and wear resistance.

Above: In many circumstances, parts can be transferred to or from a heat treat furnace and refrigeration chamber without intermediate cooling or defrosting.



Right: Where elaborate refrigeration facilities are not available, metals can be cold treated at temperatures down to about minus 90 F. by means of dry ice.

Review of Techniques

In the manufacture of gage blocks, for instance, it is a common practice to employ lengthy stabilizing cycles —some of which consume over 100 hours of time. The purpose of this is to eliminate retained austenite from hardened steel blocks so that all expected growth due to austenite transformation to martensite will take place before the gages are ground and lapped to permanent dimensions. Because of the time requirement, a few concerns like Precision Tool Manufacturing Company of Cicero, Ill., have found it possible to save money by means of subzero metal treatments. For example, where it has been necessary to produce 4 in. gage blocks comprising plain high carbon, selected quality steel with a guaranteed accuracy of three millionths of an inch, the following cycle has been successfully used:

(1) Heat blocks to 1450 F.

(2) Water quench blocks down to 150 F.

(3) Refrigerate block to −145 F. for one hour.

(4) Transfer cold blocks to tempering furnace and heat at 165 F. for one hour.

(5) Repeat operations (3) and (4) twice.

This is said to have reduced the manufacturer's stabilizing time requirements from 96 to 8½ hours. No room temperature defrosting or cooling interval was used, since it was found to be desirable to transfer blocks to or from low and high temperature chambers as rapidly as possible.

A cycle similar to the one cited above has been used to increase hardness and helps to eliminate grinding cracks and improve the wear resistance of carburized steels. It required only one cold treatment at −125 to −150 F. for 30 minutes and one hour of tempering at 350 F.

Parts comprising carburized alloy gear steels retain considerable austenite in their case after they are hardened and tempered because the average tempering temperature will not transform any considerable amount of austenite. Consequently, the parts often lack adequate wear resistance. However, if a subzero treatment is included in the processing cycle, virtually all of the austenite is transformed and much greater case hardness is attained—providing, usually, that the parts are quenched directly from the pot or furnace.

Carburizing steels that respond best to cold treatments include SAE 4320, 3310, 8620, 2512, and 4920. Refrigeration increases their case hardness from 3 to 10 points on the Rockwell C-scale.

In steels for plastic molding dies, carbon is usually minimized in order to reduce annealed hardness where the materials are to be hobbed. A common practice at present is to add more and more alloying elements to these steels so as to increase their mechanical strength properties, but this usually has the undesirable effect of minimizing the hardness and wear resistance of finished tooling surfaces due to the large amounts of austenite that are produced when the materials are carburized. A much better procedure is to chill the molds at −150 F. for 30 minutes prior to the tempering operation, since this restores high hardness—an important property in plastic tooling which is relatively expensive, and which must be used for long periods of time.

Cold Treatment of Steel

The lifespan of cutting tools has been increased as much as 500 percent by means of a variety of cold treatments, the nature of which in each case depended on the steel analysis and prior thermal history. One such treatment, for 18-4-1 high speed steel, is indicated in the following cycle:

(a) Preheat to 1550 F. and transfer to high heat of 2350 F.

(b) Oil quench.

(c) Refrigerate at −150 F. for 15 minutes.

(d) Temper at 1025 to 1050 F.

(e) Air cool.

(f) Refrigerate at −150 F. for 15 minutes.

(g) Temper at 600 F. for stress relief only.

Another treatment that has been successful (for high carbon, high chromium tool steels) is shown in this cycle:

(1) Harden from 1850 F.

(2) Air quench.

(3) Refrigerate at −150 F. for 15 minutes.

(4) Temper at 425 F.

Tool hardnesses produced by the

last two cycles range from 65 to 67 on the Rockwell C-scale.

In the production of permanent magnets, the ability of ferrous materials to retain magnetic charges has been greatly improved by refrigeration at −150 F. for two hours and tempering at 350 F. This converts non-magnetic austenite into magnetic martensite.

Cast Iron Stabilized

Cast iron engine blocks, heads, and related parts have been stabilized with unprecedented speed by cooling them at about 140 F. for one hour, and then heating them to about 550 F. Where freedom from age cracking or growth is especially important, this cycle is repeated before the parts are machined and ground to permanent dimensions.

If a die is accidentally made undersize, or if it shrinks during heat treatment, it may be salvaged by soaking it for one to four hours at −140 F. and then tempering it at 350 F. This causes retained austenite to become martensite, and resulting growth can bring the tool back to desired dimensions.

Refrigeration to prevent the age hardening of solution-treated aluminum alloys (such as the 17S and 24S alloys) is one of the oldest treatments for metals. Such materials will harden in 16 hours or less at temperatures of 32 F. or more. If chilled to −20 F., they may be stored for more than three weeks without appreciable hardening; and if chilled to −40 F., they can be stored indefinitely without aging. The effect of low temperatures in circumstances of this type is to retard what physicists call "thermal chaos," or the intra-molecular movements which are responsible for virtually all natural changes in the structures of materials.

Cold Treatment of Alloys

The dimensional stability and machinability of both cast and wrought forms of aluminum and magnesium alloys can be improved by a cold treatment which is incorporated in the following general process:

(a) Solution treat in accordance with the time and temperature recommended for the alloy.

(b) Water quench aluminum and air quench magnesium alloys.

(c) Age harden at the temperature recommended for the alloy.

(d) Air cool.

(e) Refrigerate at minus 140 F. for two hours.

(f) Bring the alloy back to room temperature.

(g) Heat to 25 F. above the recommended aging temperature for two or three hours.

(h) Air cool.

(i) Repeat operations f, g, and h.

The lower temperature exposure and overaging indicated by the above procedure not only improves stability, but accelerates structural changes that might take place in service. Thus, if any growth should occur, dimensional deviations in the nonferrous materials can be detected and corrected while the materials are being fabricated. Such detection is a matter of particular importance in the manufacture of aircraft.

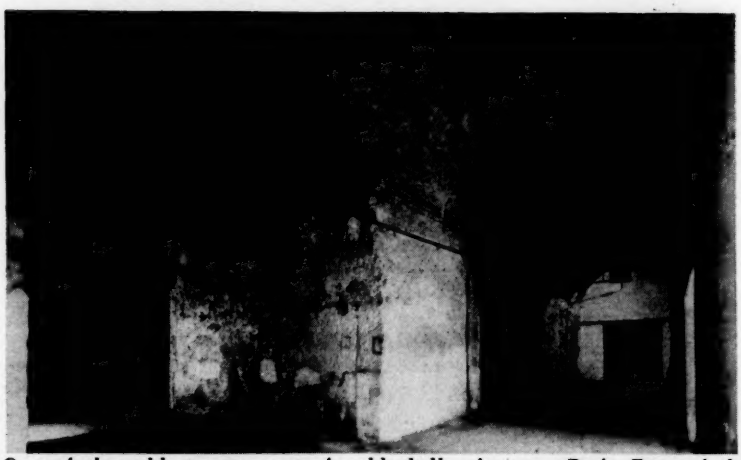
French Chalk Mines Converted to Underground Storage

WHEN THE Wholesale Fruit Cooperative Society of Paris, France needed extensive storage for their produce in 1949, they were pleased to hear of some large underground tunnels that were available for use under the Meudon Hills, in Issy-les-Moulineaux, a Paris suburb. It was thought by company officials that this ready-made underground storage area would make an excellent place for food preservation.

The three miles of tunnels had an interesting historical background. For centuries, chalk had been quarried here for use in pottery making and as a polish for gold, silver and other non-ferrous metals. Over the years the demand for chalk slackened, and until World War II mushrooms were grown in parts of the tunnels. Then after the war they again lay idle.

Refrigeration Needed

After inspection of the tunnels in 1949, the Cooperative Society acquired them and moved in crates of food for keeping. Much to their disappointment, they soon found that food would not keep satisfactorily due to the variations of temperature and humidity. At this point, mechanical refrigeration seemed to be the logical answer to the problem. After investigating the application a complete system was installed. It consisted of ten Frigidaire compressors and 37 ceiling forced air evaporators.



One of the cold storage rooms in old chalk mine near Paris. Four of the Frigidaire evaporators are visible with the lines supplying the refrigerant from the remote compressors. The rooms are about 20 feet high.

The refrigerating capacity now allows storage of 885 metric tons of apples and oranges in 282,512 cubic feet of space. Daily turnover amounts to 80 metric tons. The storage rooms are held down to 36 F. and the humidity controlled at 92 percent.

Not an Easy Task

From a technical standpoint, this achievement was not an easy one. As one of the Frigidaire engineers said, "refrigerating deep underground is an almost impossible challenge. The surrounding ground reacts as a heat tank. For all practical purposes, one can assume he is attempting to refrigerate a room with walls of unlimited thickness."

The results have been excellent. Even after 90 days of storage, fruit is kept in perfect condition and losses due to spoilage have almost disappeared. Further, the idea of connecting each compressor on a different refrigerating circuit provides great flexibility. In this manner, the storage capacity can match the needs of a highly fluctuating market at lowest possible cost.

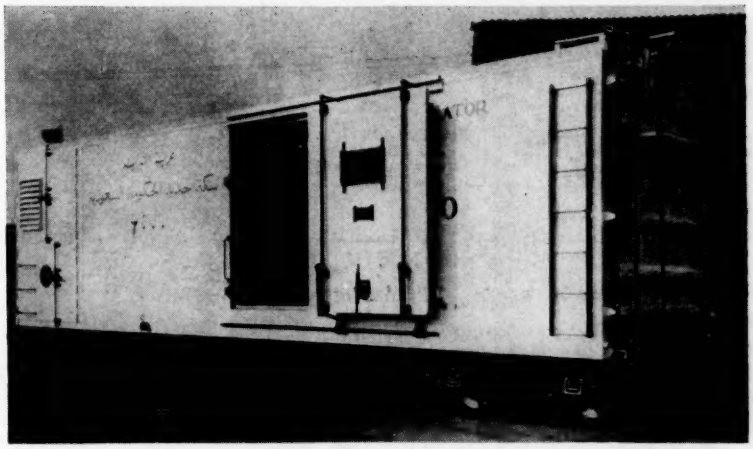
Frozen Foods for the Arabian Desert

WILLIAM SCHLAPFER

Application Engineer
Worthington Corporation
Harrison, N.J.

IT IS now possible for a person in the middle of the Arabian Desert to open a box of frozen strawberries at 0 F and allow it to thaw in the 125 F ambient heat, timing it so that he has chilled fruit for his eating enjoyment. Transporting frozen foods of all kinds across the hot sands is now accomplished with perfect safety as two prototype railroad refrigerator cars have proved during initial tests conducted by the Arabian American Oil Co.

The refrigerator cars were manufactured for use on the Saudi Government Railroad which connects the Port of Damman on the Persian Gulf with capital city of Riyadh, a distance of approximately 360 miles. This railway line, with stations near the Arabian American Oil Company's major oil producing centers, will thus provide increasing quantities of frozen foods to the area.



Overall view of refrigerator car designed for carrying frozen food in desert. Left end of car contains necessary operating machinery and air inlet grills.

Two-Stage Low Temperature Refrigerating Compressors

The railroad cars were manufactured by Societe Gregg D'Europe, S. A. Loth near Brussels, Belgium, associates of the Gregg Company Ltd., New York, and are the first in the world to be equipped with two separate two-stage low temperature refrigeration compressors. These reciprocating refrigeration compressors were built by Worthington Corporation, manufacturers of the diesel engines already at work in the Trans-Arabian Pipeline Stations.

Aramco engineers had determined that two-stage compressors would be required because of the extremely high ambient temperatures (125 F) prevailing throughout Arabia during most of the year and, consequently, excessive compression ratios would have been encountered had the usual domestic practice using single stage units been followed.

The cars themselves are steel framed, steel sheathed, wood lined and fully insulated. The roof of the cars are constructed of aluminum sheets to deflect heat. Each side has a six foot wide, sliding, flush type refrigerator door with Camel screw type door mechanisms to seal the cargo space. This cargo space is approximately 2000 cu. ft. and will transport a load limit of 80,000 pounds of food. Heavy duty Timken roller bearings reduce the possibility of hot boxes and accompanying delays. Fifty ton nominal capacity trucks of stabilized design, rubber draft gears and rotary type E couplers give the loading a smoother ride.

The cars have a length of 42 ft. over the strikers and a width of 10 ft. Inside length is 40 ft. with 7½ ft. of this used for the machinery compartment. Inside width is 8 ft. and height is 8 ft. 2 in. The height of the floor from the rails is 4 ft. 3 in.

Insulation of Reefers

To minimize heat transfer, the new reefers are insulated with aluminum sheets and 8 inches of fiberglass on the floor, sides and ends. Ceiling contains 10 inches of this type of insulation. The exterior of the cars are painted chalk white to reflect heat away from the surfaces. An overall view of one of the cars is shown, with the left end of the car containing the necessary operating machinery and air inlet grills.

Mechanical equipment for each car consists of two separate refrigerating systems each rated at 50 percent of system capacity to provide protection against refrigeration failure and resultant loss of perishable cargo. Each car includes an air cooled diesel electric generator with two 150 gallon fuel tanks slung under the frame, two 7½ hp motors, two Freon-12 compressors, two evaporators with automatic defrost mechanism, two air cooled condensers and all dust tight safety and operating controls.

The evaporator coils and fans are located atop the machine space so that they are in efficient position to blow the air out into the car above the cargo. Interior of the cargo space is so constructed, with side wall and floor slats, that the lading is actually spaced away from the sides, ends and bottom to allow the maximum contact with the circulating cold air.

The air cooled condensers are mounted in the ceiling of the car and air from the side openings of the car is forced to pass through the condenser coil and out the top of the car.

Controls are for two ranges, one for frozen foods being held at below zero and the other for fresh produce, which will hold the cargo space from 32 F to 65 F, depending upon the produce being transported.

The two compressors in each car are special machines designed by Worthington Corporation, Harrison, New Jersey and combine two stages in one compressor, the compound compression being accomplished by internal manifolding of the cylinders.

These compressors take suction gas from the evaporator at different pressures and temperatures depending on the control range. Refrigerant vapor enters the three first stage cylinders where it is compressed. After leaving the first stage cylinders the refrigerant gas passes to the single second stage, or high pressure cylinder, where it is compressed. Intercooling or desuperheating of the hot discharge vapor from the first stage cylinders is accomplished by injection of cooled liquid laden vapor from the automatic thermostatic expansion valve. The thermostatic bulb for this expansion valve is located in the suction side of the second stage head.

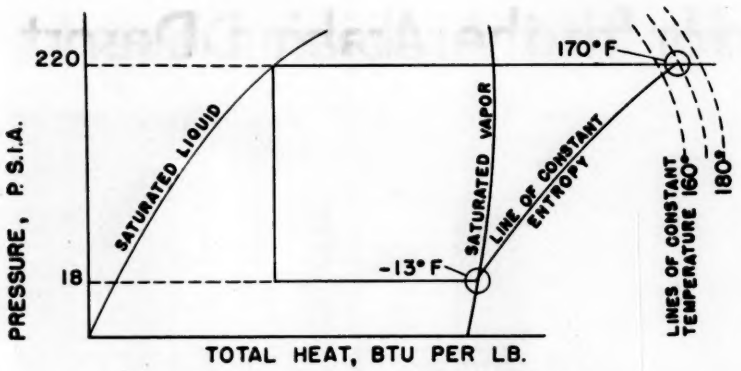


Chart 1—Mollier Chart for single-stage compressor.

Temperature of the gas is controlled before it enters the high stage cylinder thereby preventing over excessive discharge temperatures.

Two of the first stage cylinders are equipped with gas operated unloaders, which are used for start-up and capacity control of the compressor. During the start-up the unloader fingers hold open the suction strips and are held in this position for approximately 13 seconds. Then a time delay relay will allow discharge gas pressure to overcome hold down spring action and lift the unloader fingers from the suction valve strips.

The construction of these two-stage compressors is such that it is impossible to by-pass the low stage during pulldown, which is normal practice with conventional two-compressor systems. Therefore, unless the suction pressure is throttled, which can lead to complicated controls, the compressor will have to be motored for the maximum conditions during pulldown. This was not the case with these two-stage compressors as the unloaders on the two first stage cylinders reduce the horsepower requirements.

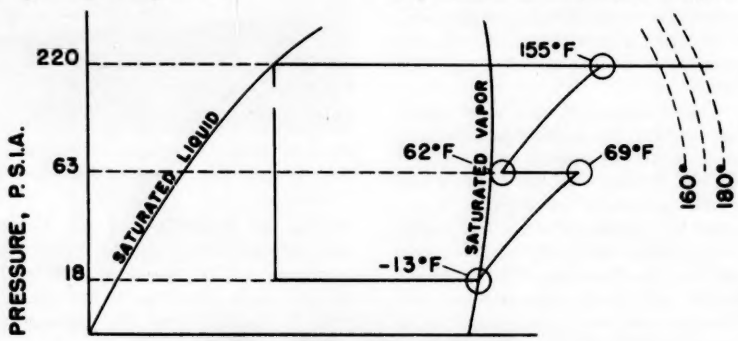


Chart 2—Mollier chart for two-stage compressor.

Need Two-Stage Compressors For High Temperatures

These two stage compressors were specified not only to prevent high compression ratios but also because air cooled condensers are used. The resulting operating pressures and temperatures are too high for single stage equipment to be used for this type of application, which is subject to extremes in operating complications.

Further data regarding the Worthington two stage compressors is as follows:

No. of cylinders, total 4
No. of cylinders, 1st stage 3
No. of cylinders, 2nd stage 1

The capacities listed below do not include heat exchange or liquid precoolers but do include interstage desuperheatings:

Capacity at − 13 F and + 140 F, fully loaded, 18,490 Btu/hr.

Bhp at − 13 F and + 140 F fully loaded, 6.63.

Heat rejected at 13 F and + 140 F fully loaded, 28,000 Btu/hr.

Capacity at 30 F and + 140 F, 50 percent unloaded, 18,150 Btu/hr.

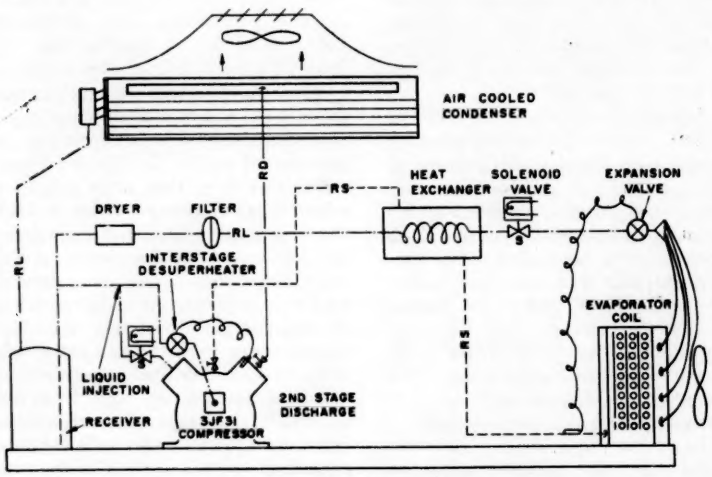
Bhp at 30 F and + 140 F, 50 percent unloaded, 5.16.

Heat rejected at 30 F and + 140 F, 50 percent unloaded, 24,800 Btu/hr.

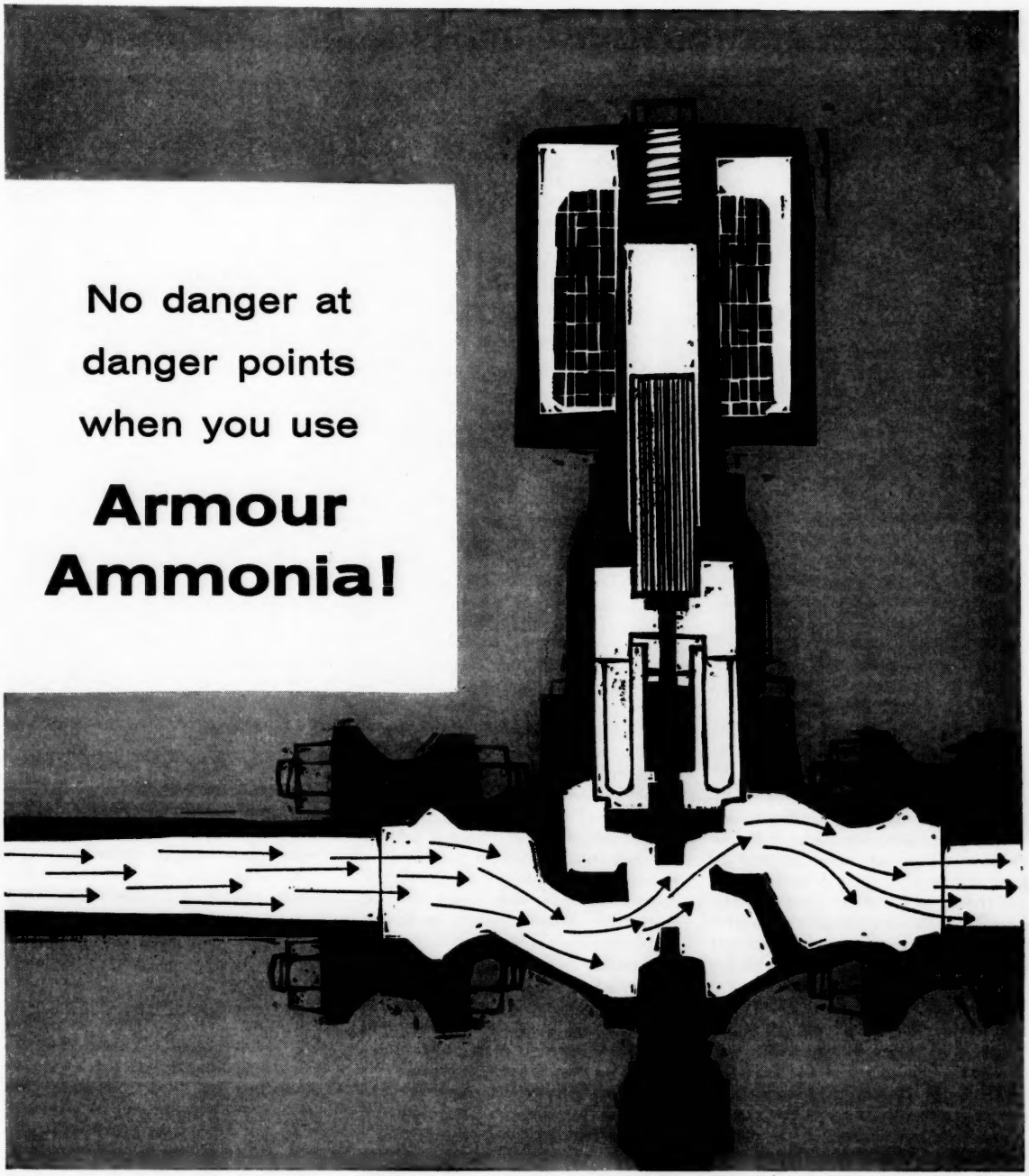
These cars are also designed to carry fresh produce and at these times the cargo space can be held anywhere between 32 F and 65 F. This is accomplished by unloading two of the three first stage cylinders on the compressors. When 50 percent unloaded, for this higher temperature region, a special method of liquid injection is brought into play to prevent the two cylinders in the one bank from over heating. Liquid is injected directly into the head on top of the valve plates and only several drops per minute are allowed to enter the head to keep it cool.

The compressor has one bank containing the two cylinder unloaders and the valve for the injector nozzle. The opposite bank therefore has one first stage cylinder and the one high stage cylinder, with the discharge shut-off valve mounted directly over it. A port over the oil pumps, is provided to allow interstage desuperheating and this is done by expanding liquid freon through a thermoexpansion valve which in turn is controlled by a remote bulb located in the head of the high stage cyl-

(*Continued on page* 50)



Scheme of compression cycle, two-stage.



No danger at
danger points
when you use

Armour Ammonia!

It's 99.98% pure, extremely dry and free of oil and non-condensable gases.

Frozen valves and other refrigeration system dangers such as corrosion, sludge and ice in evaporators can be caused by impure ammonia. They can result in the necessity of a system evacuation, permanent equipment damage—even plant shutdown! You can prevent these costly situations by insisting on pure, dry Armour Ammonia. And you can be sure of dependable service and supply, too. Armour maintains offices in 116 cities. Mail this coupon today for information on cylinder and tank truck delivery service.

Armour and Company, 1355 W. 31st Street, Chicago 9, Illinois

Send me further information on
Armour High Purity Ammonia.

Name_____

Firm_____

Address_____

City_____ Zone____ State_____

R-4

ARMOUR *Ammonia Division*

Private Warehousing May Not Be The Answer

FROZEN food packers and distributors at the National Frozen Food Convention in New York were told by F. D. Newell, Jr., president of the National Association of Refrigerated Warehouses that it would be "more profitable for them to invest in cabinet space at the retail level, where the actual shortage of storage space exists, than to invest in additional private warehouse construction."

Speaking at a "Public vs Private Warehouse" session, he said distributors, by helping to increase cabinet and backroom storage space at the retail level, can cut their distribution and handling cost, as a result of larger deliveries, and increase their sales and profits, through greater volume.

Comparing the merits of public and private warehousing, Mr. Newell pointed out "that, historically, the refrigerated warehouse Industry has not earned a very acceptable return on its invested capital, with earnings, on a replacement cost basis, bordering on the pathetic."

Complete Costs Needed

He recommended that the packers and distributors use complete cost figures in analyzing savings to be realized through private warehousing. Also, he suggested that they consider what their return would be if a like amount of capital were invested in their prime or principal business.

"There are some cases," Mr. Newell said, "where private warehousing provides the most economical approach in refrigerated warehousing.

"But," he emphasized, "I do not mean to imply that all private warehouses now being operated are economically sound, quite to the contrary. Some private warehouses are economical and some are not.

"For example, many refrigerated warehouses constructed for private use are now being operated as public warehouses because they did not pay their way as private houses.

"I speak from personal experience here. Because I now operate a public warehouse that was originally constructed for private use. Fortunately, for the owners, our plant was located in an area that made it possible to adapt this facility to public storage. Other companies have not been as fortunate.

"There are some instances today," he continued, "of distributors, who have previously constructed private warehouses, and who are returning to lease space in public warehouses. "Remember," he cautioned the distributors and packers, "your cost or your anticipated savings are not determined in one, two, or three years. The results are not actually determined until the plant is fully charged off."

Mr. Newell went on to point out some of the disadvantages of private warehouses being constructed today.

Private Warehouse Disadvantages

The disadvantages of private distribution warehouses as compared to public warehouses, according to the NARW President, are:

1. Normally, the size of the warehouse does not afford a reasonable cubic foot cost compared with similar space in a public warehouse.

2. Most often the refrigeration system and particularly the compressors, condensers, and similar equipment, has a much higher per-ton cost than equipment in public facilities.

3. In most cases electrical power is purchased at a much higher rate than it costs the public warehouse user.

4. In many instances, the distributor is tying himself to a long term investment write-off, with space that will be inadequate five or ten years hence.

5. Some of these facilities are being constructed with no provision for expansion, and much of the equipment is not adaptable to an enlarged operation incases where space is available.

Turning his attention to frozen food packer warehouses, Mr. Newell said "It is a well known fact that high annual occupancy is the most important ingredient in producing a successful warehouse operation.

"Most public warehouses," he said, "do a considerable volume of business with customers who have need for our facilities to a greater degree in one season than another. The combining of these customers with different seasonal demands in one facility assures a higher occupancy than is normally available in a private warehouse. And, public refrigerated warehouses pass on to their customers savings which are acquired through high annual occupancies.

"I know of some private warehouses" he pointed out, "that have been standing near empty for the last three months. Under these conditions it will require a number of months at near maximum occupancy to offset this loss.

"These empty or slack periods present the private operator with problems—problems that cannot be offset by the storage of other commodities.

"When these slack periods occur, are you sure your warehouse is carrying its rightful share of the general overhead burden," Mr. Newell asked the packers?

"When you use public refrigerated warehouse space, you know what your costs are. Because your storage and handling costs can be readily predetermined. Predetermination of costs in a private facility is difficult to accomplish, and sometimes impossible."

In summing up, Mr. Newell outlined several ways in which the packers and distributors benefit by using public warehouse space. They are:

1. They share in the economies of a public operation, where costs are based on twelve months occupancy —and not seasonal.

2. The storer pays only for the amount of space he actually needs from month to month.

3. The storer has a great selectivity of locations. He can store where he needs the space and change locations with a minimum of loss and inconvenience.

4. The storer is protected by the skill and experience of the public warehouseman . . . gained through years of on-the-job training.

5. The storer can use his warehouse receipt as collateral without the inconvenience and expense involved in "field warehousing".

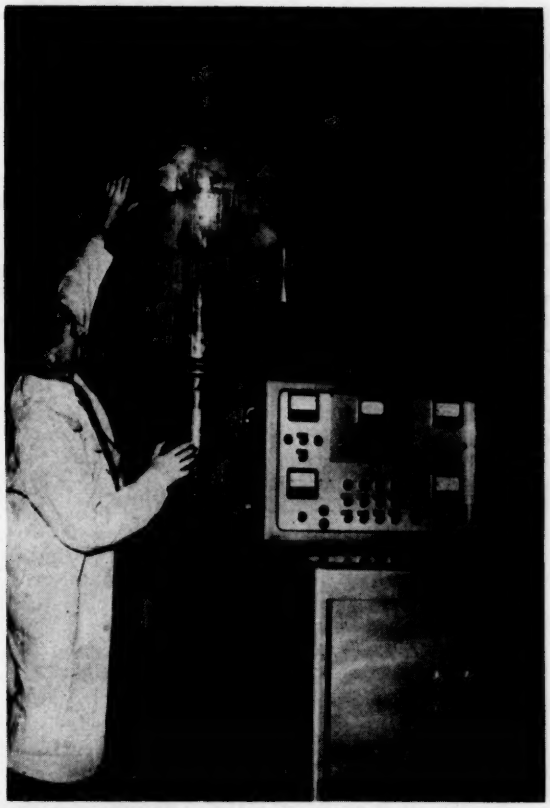
Progress of Vacuum Cooling

ALMOST all of the world-famous lettuce of the Salinas Valley of California will reach market this year after preparation by vacuum cooling. Only nine years ago, the first experiments were conducted. This is a tribute to the research and foresight of the leaders of one of California's Great Industries, says P. G. & E. Progress (published by Pacific Gas and Electric Company.)

This year at Salinas, Union Ice Company began the use of Uni-Kool, a new process by which the lettuce is chilled after it is loaded in cars. Invented by an Arizonian, C. E. Goetz, it was used last year for the first time in Phoenix. In the installation at Salinas, there are two vacuum chambers, each large enough to hold a refrigerator car or truck trailer.

Industrial Test Refrigerators Improved

Liquid Helium being drawn off from an ADL Collins Helium Cryostat. Low temperature industrial testing near Absolute is a laboratory fact today.



Dr. Ivan Simon, research physicist prepares to operate new-type refrigerator which will maintain lower temperatures than any previous apparatus.

REFRIGERATORS which will reduce the temperature of helium to minus 452 F have been on the market for several years. These instruments are in use in laboratories in the United States, Canada, Japan, India and other foreign countries. They are being used to study and evaluate for modern engineering the strange and strikingly different properties of materials at extreme low temperatures. Now even lower temperatures approaching Absolute zero have been sustained for laboratory experiments, with the development of a magnetic "heat valve".

Since 1908, when helium was first liquefied, physical literature has contained many reports of low-temperature phenomena. Because of the excessive effort to produce extreme temperatures, these phenomena had not been exploited. Scientists at Arthur D. Little, Inc., among others, realizing the tremendous contribution to science an easily available source of liquid helium would make, decided to manufacture an instrument for that purpose. Professor S. C. Collins of the Massachusetts Institute of Technology conceived the original design for the device. Working with Professor Collins, Dr. H. O. McMahon of ADL further developed the Collins Helium Cryostat.

Sustaining operations without the consumption of liquid nitrogen, which is not readily available in many laboratories, was one of the goals. A second objective of the design was the elimination of the formidable vacuum problems encountered in systems providing thermal isolation by maintaining a high vacuum around most of the liquefied parts. Also, it was desirable to have equipment which could be installed in a relatively small space and could be operated with a moderate consumption of electricity and man hours. Further, for economical operation it was necessary that the apparatus not only liquefy helium, but also be capable of maintaining any temperature down to minus 452 F with provision for generous physical space in the cold region for experimentation.

Essentially, operation of the Collins Helium Cryostat consists of compression of helium gas to 200 psig in four stages, removal of heat of compression by cooling with city water, further reduction of the gas temperature to about 35 degrees Kelvin by expansion in two engines, and finally, expansion of the precooled gas through a Joule-Thompson valve. For normal operation the cycle is closed in the sense that the charge of helium is continuously circulated around a closed system.

Continued Cold

It is now possible, in the laboratory, to sustain temperatures as low as 0.25 degree above Absolute zero. Refrigerating processes based on expansion of a gas or evaporation of a liquid are not efficient below about 4 degrees Absolute. To go further down the scale, one may use a bath

---

Portions of this article are reprinted with permission, from the December 1955 issue, Industrial Bulletin of ADL, Inc., No. 326

Photos Courtesy Arthur D. Little, Inc.

of liquid helium and pump off the vapor, but this approach fails below 0.9 degrees. The last stages of refrigeration can only be achieved by using a magnetic cooling principle. The availability of a continuous magnetic refrigerator to research laboratories should stimulate considerably more scientific work at extremely low temperatures.

In a paramagnetic material — one that is susceptible to a magnetic field — individual atoms all behave like individual magnets, and normally their magnetic "poles" are arranged in a completely random fashion. But when a magnetic field is applied, they all line up with the field, an effect that also entails adding some "heat of magnetization" to the material. This heat is conducted away to a bath of liquid helium, and then the magnetic field is removed. The atomic magnets again become disordered, and the temperature of the paramagnetic material drops abruptly to a much lower value.

Until recently, it has not been possible to sustain very low temperatures for any length of time, because the actual cooling occurred during a brief period of demagnetization, after which the heat continuously leaked in from the outside.

In 1949, a continuous magnetic refrigeration cycle was proposed by J. G. Daunt and C. V. Heer of Ohio State University, making use of a super-conducting "heat valve". This valve depends on the fact that when a metal is a superconductor (at very low temperature), it is a poor conductor of heat; superconductivity is controlled by turning on and off an external magnetic field. In 1955, the first continuous magnetic refrigerator, using this scheme, was made available commercially by Arthur D. Little, Inc.

Magnetic Refrigerating Cycle

In the ADL Magnetic Refrigerator, there is a "working substance" (iron-ammonium-alum), a liquid helium bath, and a reservoir cell that is to be cooled; the reservoir cell is located in the chamber where experiments are conducted. In operation, the system is first cooled down to about 1 degree Absolute by a bath of liquid helium boiling at reduced pressure. Then the paramagnetic material, iron-ammonium-alum, is magnetized. A "thermal valve", consisting of a strip of a superconducting metal in the center of a control coil, conducts the heat of magnetization to the helium bath. The working material, which is demagnetized after this valve is closed cools itself. A second thermal valve opens, allowing the working material to withdraw heat from the reservoir cell. This cycle of operations is repeated periodically, and the reservoir and its surroundings can be kept at any desired temperature in the range from 0.25 to 1.0 degree Absolute for any length of time.

The realization of the magnetic refrigerating cycle was made possible by the use of magnetically controllable thermal valves; the superconducting valves have the advantage of permitting the whole cycle to operate merely by changing the external magnetic fields. In one sense, this is already a practical application of a very-low-temperature phenomenon; enough has been learned about super-conductivity to apply it in a functioning machine.

Potential Applications

General effect of low temperature is the production of ordered states of matter. If, at ordinary temperatures, something occurs with an energy smaller than several hundredths of an electron volt, it is swamped by the random agitation of the world about it, caused by thermal motion. Thus, at normal temperatures a lower limit is set on the energy range of phenomena which may be utilized.

By means of energetic isolation from outside thermal motion, the entire range of low energy phenomena may be reached. With reliable and easy to operate equipment now available, many industrial laboratories are taking advantage of the opportunity to study carefully the very low energy effects, with an eye to their possible application to the problems confronting them. Communications and control processes should benefit especially from these studies, since the production, transmission, and processing of information are accomplished principally at low energy levels.

The electronics industry is already familiar with the use of refrigerated traps for vacuum work. Vapors may be pumped faster by exposing them to a cold surface than by a mechanical or diffusion pump. At liquid helium temperatures, all substances, except helium itself, are solids with completely negligible vapor pressures. A liquid helium trap may therefore serve as a vacuum pump for all gases with the single exception of helium. Fast pumping for processing of surfaces with a chemical delicacy, or for other reasons, might be handled by this technique.

At present, study of the internal conditions of metals at low temperatures is receiving appreciable attention. The so-called residual electrical resistance of a metal is dependent upon the state of internal stress and upon impurities. It is a well known fact that a normal metal shows a decrease in electrical resistance with temperature decrease down to about 15 to 20 degrees Absolute, a leveling off of the resistance occurring with further temperature decrease. This temperature is outside the range attainable with liquid air, but it is easily achieved with helium, which liquefies at 4.2 degrees Absolute. The control of metals processing is aided by such a technique.

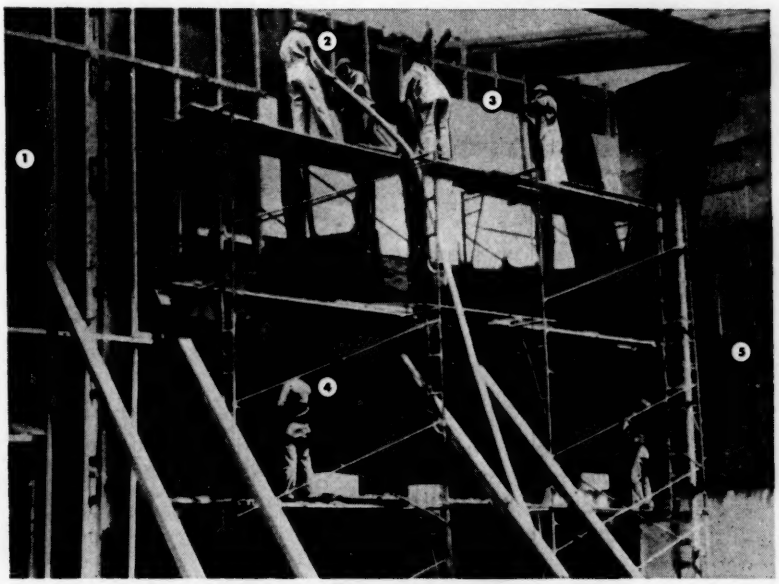
Some metallurgical reactions take place at low temperatures at a greatly accelerated pace, opening the possibility of new types of properties, metallic and other, being exhibited by materials. Contrary to the usual behavior of the electrical resistance of materials at low temperature previously mentioned, some metals show a minimum in resistance and then a rise with further temperature decrease. Diverse curves available for different metals indicate that many phenomena occur in this connection.

Another type of low-temperature electrical behavior, which has been known for many years, is superconductivity. Certain metals, such as lead, tin, mercury, tantalum, and aluminum, become perfect conductors below a specific temperature, characteristic of the individual metal. These then become perfect magnetic shields. Magnetic noise in the atmosphere may be completely excluded from a region with such a shield. Their mechanical stability is great, because the metals have vanishing expansion coefficients at low temperatures and become exceedingly stiff and rigid.

Electrical filters composed of elements made of superconducting metals would possess properties unattainable by other means. Insulators become so nearly perfect at these temperatures that they may hold a charge for unusually long periods. This may be useful, for example, in a storage tube for computers. Magnetic properties of matter are greatly changed or at least exaggerated at low temperatures. The fact that nuclear and paramagnetic resonance at radio and microwave frequencies become sharp and strong should be useful in filters, timing circuits, etc. According to an MIT Professor, low-temperature physics is a technique that will make itself felt in all fields of engineering when the variety of uses to which it may be put is more fully realized.

PALCO WOOL®

THE VOID-FREE INSULATION



Job photo shows five construction steps: 1—Vapor barrier on warm side of wall. 2—*Palco Wool* being applied by void-free method (described fully in new Refrigeration Insulation Manual). 3—Temporary retainer for next course of *Palco Wool* being nailed to studs. 4—Insulation being inspected for void-free fill in wall area exposed by removal of temporary retainer. 5—Self-supporting *Palco Wool* in place. Note how temporary retainer has been removed from all but top area, while interior finish is being placed at bottom of 27 ft. wall.

NO POCKETS—NO VOIDS

Entire wall is insulated before interior finish is applied. Self-supporting *Palco Wool* is then inspected to eliminate any possibility of pockets or voids.

NO JOINTS

Palco Wool forms a continuous insulating barrier. As a uniform unbroken mass, it fills every nook and cranny—hugs every surface. With *Palco Wool*, there are no problems of heat leaks due to improper fitting at edges and around structural members.

NO SETTLEMENT

Examine *Palco Wool* fibers. You will see the corkscrew-like structure which gives lifetime resilience and freedom from settlement.

NO TRAPPED MOISTURE

Palco Wool is impervious to moisture effects and deterioration. It is installed with no intermediate vapor dams to trap moisture.

NO CONVECTION CURRENT LOSSES

At recommended density of only 4.5 lbs. per cu. ft., it displaces so much air and breaks it up so completely that convection currents are virtually eliminated.

see our catalog in Sweet's INDUSTRIAL CONSTRUCTION FILE or write for copy

SEE THE NEW REFRIGERATION INSULATION MANUAL IN SWEET'S 1956 INDUSTRIAL CONSTRUCTION FILE OR SEND COUPON AT RIGHT FOR YOUR FREE COPY

THE PACIFIC LUMBER COMPANY

PALCO INSULATION WOOL®

100 BUSH STREET, SAN FRANCISCO 4, CALIFORNIA

THE PACIFIC LUMBER COMPANY

Room No. 2402 601

100 Bush Street, San Francisco 4, California

Please send me, without obligation:

- ☐ New complete Refrigeration Insulation Manual
- ☐ Sample of *Palco Wool* Insulation
- ☐ In-place test data on insulated structures

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

Practical Refrigerating Engineer

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

NH_3 Purger Operation

Hydrogen Liberation and Foul Gas Re-absorption

R. T. Brizzolara

ROBT. T. BRIZZOLARA

Advisory Engineer
New York City

These observations, submitted to Industrial Refrigeration readers for comment by the Author, may prove interesting. They provide another approach to the importance of purging, believed never discussed heretofore. The suggestions even provide an interesting subject for research investigation and technical comment.

More important, it may "incite" some simple inventions of low pressure type purgers, other than the present standard types involved with pressure reducing valves. If "foul gas" dissolved in ammonia releases itself in an evaporator pressure and temperature condition, the amounts so released may well reconcile many vagaries found in compressor performance at high condensing pressures according to the Author's thinking.

PROPER Collection Point and Purger Instruction discussed in the January 1956 issue of INDUSTRIAL REFRIGERATION is always an appropriate subject to be frequently discussed in the refrigerating industry. In Question No. 1085, page 43, the problem was an association with the behavior of an Armstrong purger. In my career, extending back near to 40 years, I have used practically every type of purger manufactured, including some of my own. The Armstrong purger, in my opinion, is one of the best pieces of equipment ever offered for that purpose.

The difficulty your correspondent described, however, is typical — not only with Armstrong purgers, but with all purgers working on the principle of condensing out liquid from high pressure vapor mixtures. That purger will eventually fill up with liquid, like all others. This tendency (filling-up soon after start up) is associated with the operating condenser pressure.

Condensing Pressures Affect Purger Function

At condensing pressures well below 150 psig the difficulty of purgers filling up with liquid rarely occurs. Beyond 155 psig, the effectiveness of the purger diminishes and at some point (difficult to ascertain) of 170 to 185 psig, the purgers cease to function and fill up with liquid. The exact point of cessation is difficult to pinpoint, and appears to be a variable matter over a wide territory.

The writer became particularly interested in this subject some years ago and investigations led to the conclusion that the difficulty must be ascribed to the fact that non-condensible gases for the most part are a mixture of nitrogen and hydrogen released by the ammonia, however impossible that may appear. At those critical pressures (170 to 185 psig), the "foul gases" incline, as the pressure rises, to redissolve themselves in the refrigerant ammonia liquid, and to considerable volumes. At pressures of 190 upward, rarely, if ever, has this writer observed any automatic purger being able to function.

Only the fact that these non-condensible vapors are dissolved in the liquid, whether warm or cold, satisfactorily explains this failure to perform. From the tests undertaken, and from long experience, it was established that some locations in an individual system were better than others for isolating and drawing off "foul gas", — the top of the receiver the better location over a period of time. Ultimately, however, the purger would follow the rule of not functioning after the aforementioned critical range of condenser pressure was exceeded. The Armstrong purger appears to lend itself readily for checking the phenomena of dissolving accumulated "foul" gases. The following test, which can be made on any installation and is readily performed with an Armstrong purger, will prove interesting. (Illustrations on next page show typical purger hook-up with additions recommended by the Author, and the liquid at normal and test levels.)

Tests Failure Theory

The test is best made at the time when the purger has filled up to the top of the glass and has ceased to function; likewise, when the pressure has risen beyond 190 psig. At that time it will only be necessary to

EXECUTIVE OFFICE NAPRE
433 N. Waller Ave.,
Chicago 44, Ill.
OFFICERS
President: Leroy Etzel
Los Angeles, Calif.
Secretary, J. R. Kelahan, Chicago 44.

Operating engineers of all refrigerating plants are invited to affiliate with the National Association of Practical Refrigerating Engineers, Inc., an educational association, "not-for-profit".

A Columbia University graduate, M.E. — 1916, the author has been in the refrigerating consulting business since 1917, aside from a period during World War I, when in the Air Service. From the period following the war to date he has been engaged in the business of designing, constructing, directing and operating numerous refrigerated warehouses, ice plants, ice cream plants, breweries, etc. His own consulting business has been continuous since 1928 to date.

ALWAYS DRY

B-P NATIONAL

ANHYDROUS AMMONIA

Moisture content of less than 50 parts per million insures

- Better Refrigeration
- Less corrosion
- Greater efficiency of Refrigerant and System

ANHYDROUS AMMONIA NATIONAL TRADE MARK

Sign of Dependability

Since 1890

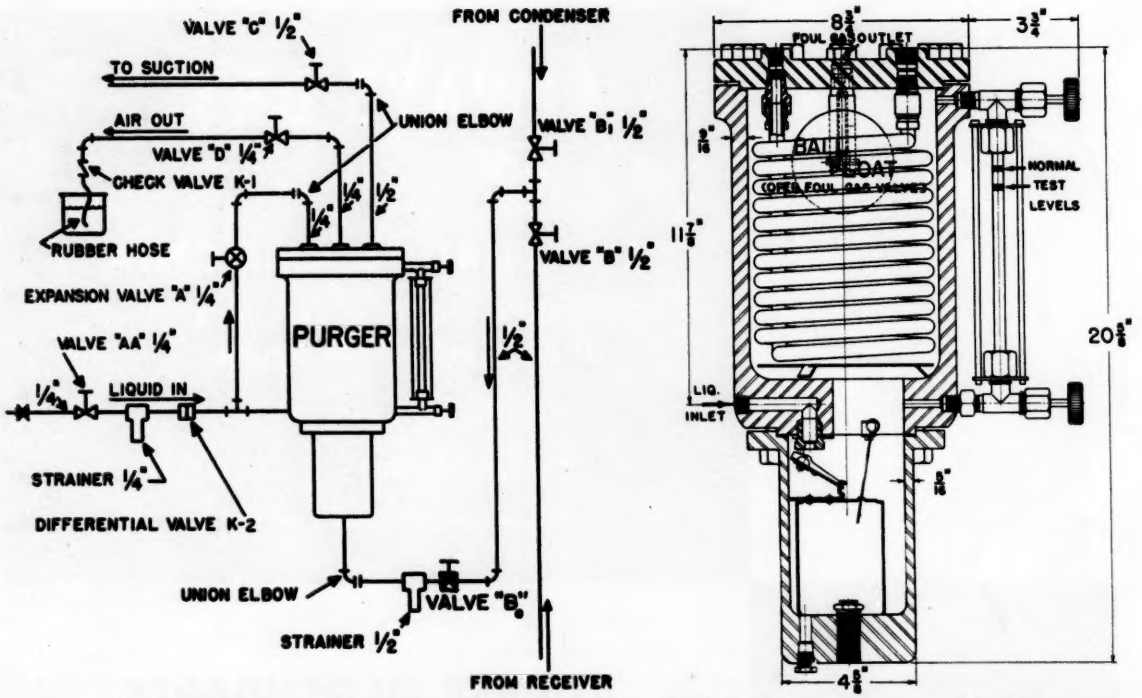
ALWAYS DEPENDABLE

ALWAYS UNIFORM

Guaranteed 99.99% Ammonia

B-P **BARADA & PAGE, Inc.**

Colorado — Denver — The Chemical Sales Co.
Illinois — Chicago — The Creamery Package Mfg. Co.
Indiana — Indianapolis — Wm. Lynn Chemical Co. Inc.
Iowa — Sioux City — Kennedy & Parsons Co.
Waterloo — The Creamery Package Mfg. Co.
Kansas — Wichita — Barada & Page, Inc.
Kentucky — Louisville — Merchants Chemical Co. Inc.
Louisiana — New Orleans — Barada & Page, Inc.
New Orleans — Whitman-Holloway-Olivier
Michigan — Detroit — Davis Supply Co. of Detroit, Inc.
Flint — Davis Supply Co.
Minnesota — Minneapolis — The Creamery Package Mfg. Co.
Missouri — Kansas City — Barada & Page, Inc.
Kansas City — The Creamery Package Mfg. Co.
St. Louis — Barada & Page, Inc.
Nebraska — Omaha — Kennedy & Parsons Co.
Ohio — Cincinnati — John H. Schafer, Inc.
Oklahoma — Oklahoma City — Barada & Page, Inc.
Tulsa — Barada & Page, Inc.
Tennessee — Memphis — Bessire & Co., Inc.
Nashville, — John Bouchard & Sons Co.
Texas — Austin — R. M. Hughes & Co.
Corpus Christi — Barada & Page, Inc.
Dallas — Barada & Page, Inc.
Houston — Barada & Page, Inc.
Odessa — Barada & Page, Inc.
San Antonio — R. M. Hughes & Co.
Utah — Salt Lake City — Louis A. Roser Co.
Wisconsin — Milwaukee — Reichel-Korfmann Co.



Typical book-up recommended by a purger manufacturer pictured at left. The author recommends a thermostatic expansion valve in lieu of the hand operated expansion valve "A" shown. He also recommends a valve at position B_0. When making the test described, valves "AA" and "B_0" and/or "B" and "B_1" must be closed. Bulb for the recommended thermo-valve would be located on the 1/2-inch suction line between valve "C" and the purger. Right: Detail of the purger shell, coil and air trap. Liquid levels described by the author are pictured on the gauge glass. Liquid feeds in through opening at lower left when purging operation starts, but will reverse under a high build-up in the glass, if the test description is followed. Foul gas or air is vented through top of purger shell by ball-float operated valve. Pin through vent hole in inverted bucket trap keeps vent from plugging. "Hot gas" enters under bucket and through a check valve.

close off both the foul gas *supply to the purger* and the *main liquid supply* line to the purger unit assembly. Liquid must be permitted, as heretofore, to continue "expanding" through the cooling coil within the purger. (At this point of the test the main liquid supply and "foul gas" supply lines will be shut off, but all else normal and undisturbed.)

In the purger shell a supply of cold liquid will expand through a coil within the shell. (For the test, manual control is preferable.) This "expanding" will be a slow process if controlled closely as not to involve flooding of the cooling coil into the compressor suction line. The reason for slow "expansion" is, of course, owing to the fact of no heat supply load to boil off the coil liquid rapidly. In due course, however, (slow or fast) the supply of liquid in the shell is "expanded", the liquid level in the shell and glass will drop, along with the pressure and temperature therein. When the liquid drops down about one-half inch in the sight glass, gas bubbles or boiling in the glass will occur and accelerate as the level drops. This phenomena is that of the liquid boiling off in a warm glass, and as normally follows with a reduced pressure and temperature.

As the liquid drops down further in the glass, and when reaching 1 to 1¼-inch down from the top of the foul gas purge line in the shell, the vent entering a flask or 5 gallon bottle filled with fresh water will suddenly erupt with large continuing volumes of released "foul gases" passing down and up through the water. In practically all instances this "foul gas" now coming from the purger is almost entirely odorless, and large volumes of it will continue until released from the shell's liquid contents. Then follows a strong ammonia odor escape. Just as the odor of ammonia is noted the writer found that the mixture will burn quite freely with a blue flame—hydrogen. When "rank" ammonia vapor emerges it rarely will burn or flash.

If, when purging rapidly, the "foul gas" supply or liquid line is cracked open to build up the pressure in the shell, the "foul gas" emission will cease immediately. Large volumes of odorless gas leaving the purger can readily be trapped and measured as to quantity, and will be found to exceed the contents of the shell many times over!

Hydrogen Released

The first "foul gas" mixture coming off the purger appears to be inert, and is either nitrogen and/or air, followed thereafter by hydrogen. To attribute the excessive near odorless amounts of "foul gases" first released from the shell as air, is difficult to validate in a system long in service and at positive pressures. Their creation cannot be ascribed to air infiltration.

The many tests made indicate the solubility of "foul gas" in ammonia liquid and offers no other explanation. Chilled high pressure liquid as exists in the purger shell understandingly dissolves more "foul gas" vapor in it than warmer liquid normally does. Foul gas accumulations most often, and too frequently, reveal

themselves immediately after fresh charging of ammonia into a system has occurred, and when carefully performed with the system under positive pressures and from first purged drums and connecting piping.

NH_3 Production Figures

It is to be appreciated that ammonia manufacturers in preparing ammonia for refrigerating purposes distill their product repeatedly, to secure a stable quality ammonia. At such times when circumstances arise and it is not too well distilled, the consequences will be much "foul gases" being released into the refrigeration system. This observation is an old complaint of many "old time" operators, and not entirely a figment of imagination, as the writer came to learn. In 1956, United States manufacturers will produce about 4,500,000 tons of anhydrous ammonia, a figure up about 200 percent in the past five years.[1] Less than 0.3 percent of this quantity is produced for refrigeration purposes.

[1]Chemical Engineering News

Blames Free Hydrogen For Post Explosion Flash Fires

The solubility of nitrogen and hydrogen in ammonia can explain many explosions which follow a violent rupture in an ammonia system, and one in which too frequently much "foul gas" has evidenced itself. The sudden release of high pressure over ammonia liquid saturated with "foul gases" affords the release of considerable volumes of free hydrogen. It is hydrogen gas alone which so readily ignites and detonates. It well explains the "flash fires" so often associated with a rupture in a high pressure liquid line.

News Notes and Chapter Activities

Colton

HARRY BONTER

THE evening of February 7 is a night to remember with California No. 5 Chapter. The chapter members were highly honored to have two distinguished guest speakers, Leroy Etzel, NAPRE National President, and Robert F. McKee, mechanical engineer for the Pacific Fruit Express Co. ice plants. Both gentlemen came down from the PFE Co. office in San Francisco, Calif., for our "benefit" social. Their talks were enjoyed by all present. The proceeds from the $1.50 per plate went into the chapter treasury to help build it up as it was getting extremely low. We may do it again sometime.

This meeting was attended by 36 members, friends and their wives who enjoyed a ham dinner. The material for the dinner was donated by the members. Messrs. Schroeder, Scherer and Hooker did a fine job of baking the hams. The salads by Berchtold and Franklin were also very tasty and to go with the hams were sweet and Irish potatoes by Purkiss. The three chefs dressed in their aprons and caps and served the dinner cafeteria style. To finish off the dinner, Bro. Chantry passed a box of cigars for the men to enjoy a smoke. Purkiss and Bonter took several pictures of the groups at the tables.

Tampa

MARTIN SMITH

MEMBERS of the Tampa Chapter made a tour of the Tampa Electric Company's Hooker Point plant on February 16, which was our regular meeting night. The staff of the plant had us gather in their assembly room where we met the chief engineer, W. W. Hunsinger, the ass't. chief, B. D. Cone, resultant engineer, H. A. Moshell, the mechanical engineer, A. L. Steinlen and the maintenance engineer, V. C. Simmons. The latter is a member of Tampa's Engineers Examining Board.

Tampa Electrical Co. personnel treated us with consideration and were probably the most polite people we have met for some time. There was a case of cold drinks waiting for us. After the drinks and some preliminary discussion we were broken up in small groups, each group under the supervision of one of the above named men.

Left: Colton Chapter's guests at dinner with Chapter President and Mrs. Arthur W. Franklin, are Bob McKee, San Francisco member and Leroy Etzel, National President. Right: At the table supervised by the kitchen help, clockwise, are E. H. Carlson, T. C. Bangs, J. E. Machut, Chapter 1st Vice-Pres., F. J. Scherer, instructor, Alvie Miller and E. V. Berchtold, The chefs are L. G. Schroeder, Carl Hooker and C. H. Purkiss.

In the foreground at the luckier table are, on the left side, l. to r. Mrs. Alice Miller, Mrs. and 2nd Vice-Pres., J. E. Finfrock, A. L. Long, Roy Ashcom, Mr. and Mrs. C. E. Luker, Mr. and Mrs. J. H. Mairs. Across the table, r. to l., are Mrs. Roy Ashkom, an unidentified camera-shy lady, Mesdames Hooker, Purkiss, Long, Schroeder and Chantry, and Bro. Chantry with his arm on the table.

Starting at the river (estuary) from where the condenser water is supplied, we proceeded to a small shed housing the chlorinating equipment used to treat the condenser cooling water, then to the fuel oil pumps and heaters (Bunker "C" is used). Next was the forced draft fans and the air preheaters. On the way we stopped to look at the proportioning pumps used to treat the boiler water. They use evaporators and water is supplied for this purpose from the city main.

Next stop was the condensers. After the condensers, Mr. Steinlen (who was in charge of the group I was with) called attention to the steam jet refrigeration used to cool the lubricating oil. From there the

(Continued on page 36)

From the President's Desk

Milk Industry Membership Drive Gathers Momentum

Chicago Complimented; Comments on Dues Remittances

FIRST Chapter reporting new members as a result of their own local efforts in the Milk Industry, is Denver. This recently chartered affiliate has kept right on recruiting new members in all fields. However, they made a point of bringing national attention to their efforts in dairy and ice cream manufacturing fields by reporting promptly.

New members accepted during the Milk Industry drive were named in their chapter meeting report forwarded to national headquarters the day following. This assured the Chapter of recognition, as here was special emphasis on their desire to cooperate in the National membership drive. A remittance advice, accompanied by the new members' accepted and approved applications, followed through usual channels. Had there been a prize for earliest chapter in, Denver would have another first!

Package Review Given Of Dairy Refrigeration Uses

In the cooling and handling of milk, growth of bacteria is dependent on the temperature. Refrigeration is required in the cooling of the raw milk as well as cooling after pasteurization. This may be done with direct expansion halogenated hydrocarbon refrigerants, ammonia, or ice water from latent heat tanks. Milk is then bottled and held in storage at temperatures of 40 F or less. During the delivery phase, it is kept cool by packing cracked ice around the crates and/or mechanically refrigerated truck transportation.

In the manufacture of butter, skim milk, chocolate milk, and like products, controlled temperatures must be maintained to preserve flavor and produce the best possible product. The same is true of raw ingredients for ice cream and frozen desserts. Very cold temperatures must be used in freezing ice cream products, usually zero to minus 15 F. After freezing and packaging, it is placed in hardening rooms and held at temperatures of minus 20 to minus 30 F until such time distribution is made. Again refrigeration is employed by use of mechanically refrigerated trucks or insulated jackets containing dry ice.

Know Dairy Refrigeration

NAPRE members who take pride in their position in the refrigeration industry as a whole, will make a point of learning the extensive applications of refrigeration in the Milk Industry. Like your own segment of this field, be it brewing, cold storage, air conditioning, ice making, steel production, or transportation, the end uses of that utility (refrigeration) are worth learning about.

Know the production steps involved in each product produced, and the purpose behind the low temperature demands. Further, study the operation of the unit to improve its efficiency through proper operation, timely maintenance and helpful suggestions to production, management and company engineering consultants. Your interest will result in self improvement, in your own field, enhanced value to your employer, and, indirectly, assist NAPRE's industry relations program.

Taking time to learn and study refrigeration uses in other industries, has never retarded any of our members. Half of NAPRE's national officers or directors are not in the same field today as when they started. One has successfully progressed from shift engineer with a meat packer, to erection engineer for a creamery chain, to first assistant in a brewery, then chief of an ice cream manufacturing plant, and now supervising engineer for a chain of cold storage plants.

Another has a marine refrigerating experience behind him, and after some time as chief operator of an air conditioning plant, is now construction and engineer superintendent for a couple of skyscrapers. Still another has successfully held important progressive positions in hospital, hotel and brewery plants. To know other industry applications and be competent in their operation provides rungs on your success ladder.

Urges Dairy Meetings

This is not to say that the man who stays in one industry is not successful. The other half of NAPRE leadership has done just that. But, through study outside their field they have acquired ideas and operating knowledge that enabled them to stand head and shoulders above the boys, when promotions for men were announced. Chapters are again urged to arrange a Dairy Night, to enable members to learn more about refrigeration in this industry.

Local program chairmen should arrange with your industry or public relations committee to invite local dairy engineer and management participation. Invite them to your meeting, or promote a visit to their plant when in operation. Obtain a good speaker on dairy refrigeration.

A talk like Earl Bergstrom gave at Los Angeles in 1954 would be ideal (Published in IR, May 1955). Devote your question box session to that industry's refrigeration problems. Perhaps the chapter instructor could prep members at an earlier meeting from Chapters 24 and 25, Basic Refrigeration. Membership committeemen should follow up on prospects developed.

Cites Chicago Chapter Reports

For their second January meeting, Chicago chapter made a tour of the Underwriters Laboratories in that city. Attached to the regular report was a paper obtained by the chapter officers covering the description of the testing performed by this service organization, on air conditioning and refrigerating equipment. Although the equipment tested would not be machines normally operated or serviced by NAPRE members, it was nevertheless interesting to see the extent to which the laboratory goes to prove the equipment reliable. By attaching this paper and obtaining photographs from the laboratory, the chapter has set the stage for all chapters to enjoy their visit at a later date through our official organ.

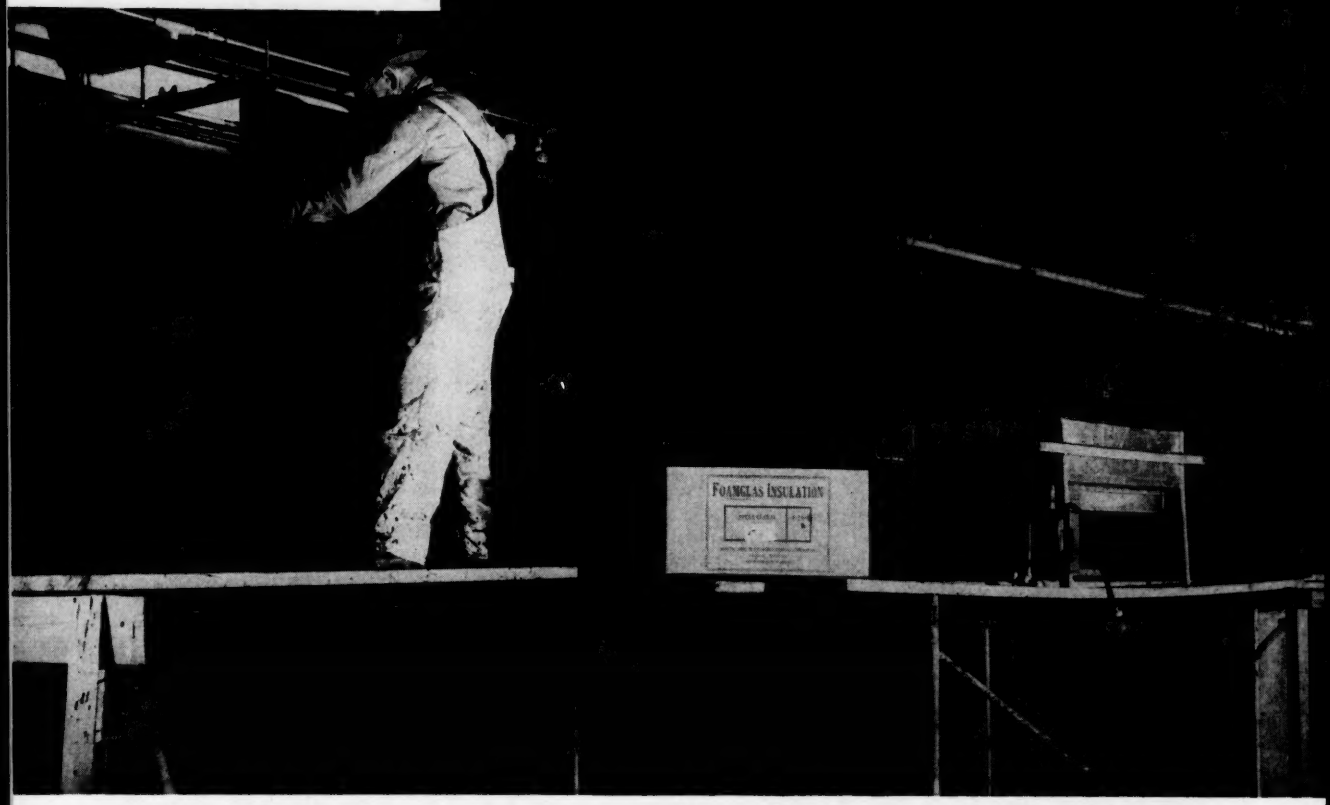
Treasurer Lists Suspensions

This April issue of IR may be the last one received by any NAPRE member who is in arrears with his dues. National Treasurer, Leland Kenagy, has announced that all delinquents have been removed from the circulation list as of April 1, and the April issue will be the last edition received. Kenagy optimistically points out, however, that the delinquent list is down percentagewise over previous years. Reader members of this column are cautioned to review their dues status. If your 1956 remittance is not in the hands of your secretary-treasurer, or the national office, you should take care of this obligation immediately by mail in order to continue receiving benefits of your membership. One of the principal benefits is the monthly receipt of Industrial Refrigeration. Don't miss an issue as the Association cannot guarantee replacement of back issues.

L. Etzel

FOAMGLAS®

the cellular, stay-dry insulation



In new —20°F. hardening room . . .

Carnation cuts construction costs with free-standing insulating wall of FOAMGLAS

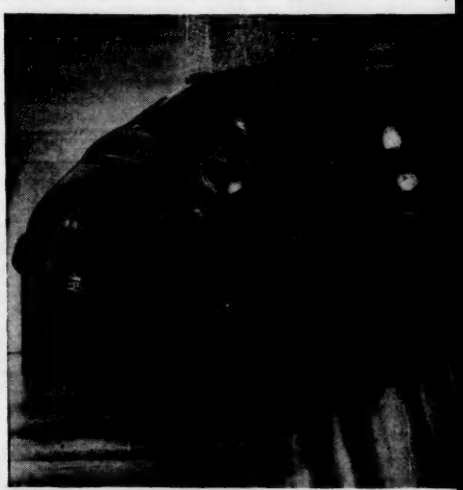
The Carnation Company, Oakland, California, built this free-standing insulating wall entirely of FOAMGLAS. The free-standing wall enabled them to cut construction costs for their new —20° F. ice cream hardening room. FOAMGLAS made this possible because its rigidity and unusual strength enabled it to function as *both* insulation and structural wall. Not even temporary supports were needed.

Carnation also used this unique cellular glass insulation for all other walls plus the floor and ceiling of the room. Its sealed glass cells mean FOAMGLAS stays dry, its insulating performance stays constant. That assures dependable temperature control and an end to the headaches and expense of insulation replacement. What's more, heavy loads can't hurt the extra-strong floor insulation.

You, too, will find this unique, *stay-dry* insulation the perfect answer for refrigerated spaces, piping and equipment. Completely inorganic, FOAMGLAS can't warp, shrink or swell . . . is vermin-proof and fireproof as well. Write us today for a free sample and up-to-date literature covering your specific needs.

Pittsburgh Corning Corporation
Dept. T-46, One Gateway Center
Pittsburgh 22, Pennsylvania
In Canada: 57 Bloor St. W., Toronto, Ontario

With this simple test you can quickly demonstrate for yourself the remarkable compressive strength of FOAMGLAS (over 7 tons per square foot). Write now for a free sample and complete directions for this and five other simple tests . . . easily performed right in your own office.



Pittsburgh Corning also manufactures PC Glass Blocks

(Continued from page 33)
group went to the upper level to see the instrument panel used for the boiler or should I say boilers? They have five, also five generating units. After the boiler visit, we saw the generators, exciters, etc., which are hydrogen cooled. From there we went to the distribution (electrical) panel where we spent some time discussing base load's, demand charges, etc.

This is just a general report of the trip, as if the plant were described in detail it probably would be several volumes. Naturally Tampa Electric had boiler feed pumps, automatic combustion, feed water regulators and all the necessary auxiliary appliances.

The old Tampa Electric plant is located at the foot of Parker St. on the Hillsborough River and has a capacity of 60,000 k.w. This new Hooker's Point plant has three 33,000 k.w., one 40,000 k.w. and one 60,000 k.w. units. It went into operation in 1948 and is a relatively new plant. Another new plant is under construction at Black Point on the eastern side of Hillsborough Bay. The first unit is to be a 60,000 k.w. and is to go into operation in the near future.

At our last meeting, February 23, more time was spent in discussing this plant than refrigeration but it is believed that we can catch up on our refrigeration course with a little home work. Since forming the chapter here we have had one of our members appointed to the engineers examining board. He is N. J. Strickland. Another member is the above mentioned V. C. Simmons.

(By Frank Goulding)

PRODUCTIVE Maintenance" an educational presentation by General Electric Co., was the film shown at our meeting of January 26. There followed a question and answer period conducted by Paul Poland of G.E.'s Jacksonville office. Poland stated that G.E. would help the maintenance man present this program to management. (Alert members also noted that this plan was detailed on page 31, January '55, Industrial Refrigeration.) Member Martin Smith told the assembly how part of this program was being used and put into effect in the brewery business. Bob Seiden discussed how this would reduce down time in the dairy, also the conflict between production and maintenance.

Instructor Rhodes then opened the educational program with a review of Chapter 1, Basic Refrigeration. A pamphlet on compressors by Freezing Equipment Sales Co., was used to show types and applications. The following questions were asked. How does a centrifugal compressor work as compared to a reciprocating pump? (Formula is Constant Velocity = Pressure^2). How is a centrifugal compressor compounded to raise the pressure? How can an actual flow compressor be used for refrigeration? How does it compare with an actual flow centrifugal and a rotary compressor? How would a centrifugal compressor handle low temperature refrigeration? Will liquid effect a centrifugal compressor? How can cavatation in centrifugal compressors be reduced? How is super heat removed from an NH_3 centrifugal compressor? After discussing these questions the meeting was adjourned. Coffee and cake was served by the entertainment committee.

Rhodes opened the educational meeting on January 19, with a lecture pertaining to Chapter 1. After discussing this chapter, Rhodes asked if there were any questions that the members would care to ask or discuss. The following questions were asked and answered: Could a water jet be used to pull a vacuum using water as a medium to create refrigeration? What was the relative cost as compared to mechanical refrigeration? Why wasn't this practical? Could you use solar heat to produce power and energy to run an absorption system? Instructor Rhodes was asked to explain entropy. A film from the state library titled "Repair and Replacement of High Side and Low Side Floats", was shown.

The business meeting held directly after the educational program was opened by Martin Smith with the presentation of recommendations by the nominating committee. The nominees were presented, voted on, and accepted. They are: Pres., C. Scott Johnson; Vice-pres., Robert T. Seiden; 2nd Vice-Pres., Joe Bustelo; Secretary and Treasurer, Frank Guida; Corres. Secy., Frank R. Goulding and Sgt.-at-arms, Fred L. Goodwin, Sr.

The 1956 travel cards were presented to the 24 members present. It was decided that the entertainment committee would be responsible for the arrangements pertaining to the presentation of the charter and installation dinner March 15. The Board of Directors will draw up the by-laws. The following committees were formed: Executive (Board of Directors), Educational, Membership, Entertainment and Publicity.

At this January 19 meeting, the members present also acted to select the last Thursday of each month as the regular business meeting. The are held at Borden's Dairy, 3319 Florida Ave., Tampa.

Stockton-Modesto

Harry Dyer

LATEST meeting held was at the Santa Fe ice plant Tuesday, February 7, 1956. Several new faces appeared for the meeting and the guests were welcomed by members present. We had a film donated by General Electric Co., titled "The Inside of Arc Welding". It covered fundamentals, flat, horizontal, vertical and overhead positions and covered both A.C. and D.C. current. The film lasted approximately one hour and certainly described in full the different phases and types of welding done in the everyday shop and plant. Our new 16 MM projector is certainly being used to full advantage and we again wish to take this means to express our appreciation for the donations received for its purchase from the various organizations and members thermselves.

The King course Basic Refrigeration is to be resumed and it is believed we will start from the beginning to permit new members to obtain full benefit from the course. Plans were also made to show a film covering hot water heaters and causes for their exploding, at the next meeting to be held in Modesto. We have also started a campaign for increasing the membership in 1956. From all appearances we should do as well if not better than 1950.

Venemann Chapter

Jim Ludewig

FIRST announcement by President Tony Wochna, at our February 22 meeting was that he had succeeded in getting John Keenen, Jr., to act as our instructor. John teaches night classes in several of our high schools and he has graciously offered his services. Since he has a class every Wednesday night which requires him to be at the high school a few minutes after 7:00 pm., we will start future meetings with the class at 6:15 p.m. sharp and then John can catch his bread-n-butter class right after ours. He presented a few pages from "Basic Refrigeration", with illustrations at the blackboard. According to the manner in which his instruction was received, it should prove to be excellent start of our meetings.

President Wochna suggested that each member express his opinion as to what would interest them most for the balance of our meeting programs. After some discussion it was decided that after our business meeting, some of the members bring out interesting phases of their experiences. First one to offer was Larry Barton who, after drawing a diagram on the blackboard of an existing system, gave us some of his experiences with sludge and scale which stopped up a shell-and-tube condenser.

Sioux City

Vern Howard

THIS being the first formal report submitted, it should be brought out that several interesting events have taken place in previous months. P. C. Peick, representing Socony-Mobil Oil Co., presented a film titled "The Inside Story" on refrigeration and bearing lubrication, and conducted a question and answer period after the film. Various local firms have donated equipment which is being overhauled by the members as a class project. Last month, February, the questions asked and discussed were taken from Chapter 14 of Basic Refrigeration.

National firms have been very cooperative in furnishing instructional material which is being incorporated into a permanent library for the continuing use of the local chapter, by member Charles Solomon. The chapter has made two field trips; the first to the Frank Pilley & Sons Co., Div. of City Products Co., where our host was member C. H. Dahman, Chief Engineer. The second field trip was to Roberts Dairy Co., where the tour was conducted by NAPRE members Maurice Bousquet, Asst. Supt., K. O. Isaacson and John C. Connolly, Operating Engineers. These proved very interesting and instructional.

Members are planning a trip to Omaha, Nebraska, to visit the U.S. Cold Storage Plant as well as the Omaha Cold Storage Plant. Our Instructor Dale Brady has made a very good presentation of the material in the Basic Refrigeration text and interest in the chapter remains high. C. E. Zink, Director of Industrial Education for the Sioux City Public Schools is endeavoring to find us a permanent location

for our equipment and library. Business of this chapter is conducted informally prior to the bi-weekly class sessions and consists mainly of reading correspondence sent and received.

Texas Coastal Bend

DAN CHAPMAN

OUR meeting January 20, was called to order by Vernon Kummel, our new Vice-President, in the absence of Dan Miller, the new President. After the business of the old year and the new business was dispensed with, the meeting was turned over to Herb Snyder. He read and discussed a paper on lubrication that was put out by the Texaco Co. Herb also led the class in a discussion of the Chapter on lubrication in Basic Refrigeration. Each member was given a chance to answer questions at the end of the lesson.

On February 17, after our new donut and coffee routine (which is to be tried in an effort to get prompter attendance), the meeting was called to order by Vernon Kummel. Plans for the new year which consist of a stepped up membership drive, an alternating plan of a field trip or a speaker each month, a possible change in meeting night, and also the possibility of each member leading the class in a short talk on his pet subject were referred to appropriate committees, the meeting was then turned over to National Director, R. A. O'Neill.

O'Neill drew a diagram and with this prop planted a picture in the minds of those present, of the real danger that lies in a self contained refrigeration unit. He told of an accident that was fatal to two men at San Juan, Texas, one of whom had been in the refrigeration industry many years. It appears that the system was not properly evacuated after being opened to the atmosphere for repairs. A severe explosion resulted, which completely demolished the machinery and part of the building.

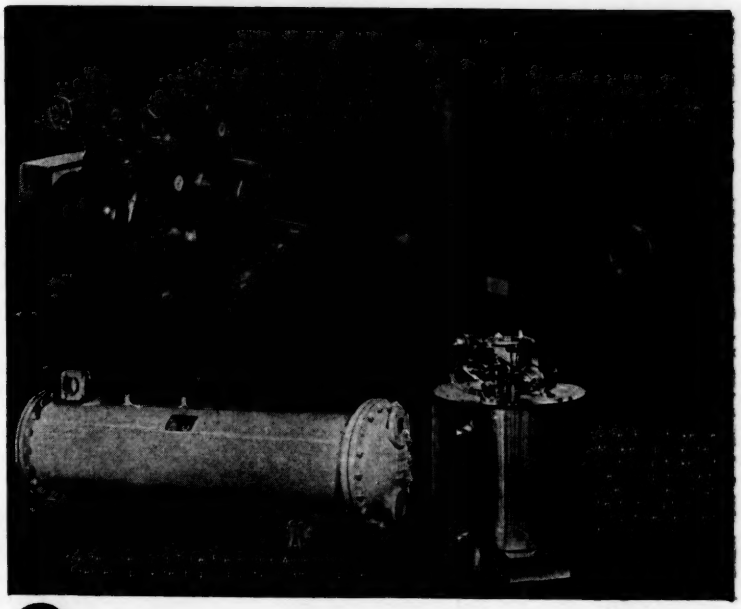
Many questions were asked and answered, pertaining to the explosion. One answer that was not clear and one which we wish help on is, what percent air and oil and at what temperature or possibly what pressure will it explode?

Detroit

LEO GAGE

GOEBEL Brewing Company, one of Detroit's largest and finest breweries, was the scene of Michigan No. 1 Chapter's January 19 meeting. John Grzebik of Goebel's Public Relations staff acted as host for the Brewery, and together with his assistants made our members most welcome. Guided tours were conducted through the brewery premises in several groups to make it more convenient for the members to observe and understand what was being pointed out in the various departments.

Although one of the oldest breweries located in Detroit, this plant has kept abrest of brewing and bottling (and canning) production developments. They were also among the first to expand to the West Coast, having a plant at Oakland, Calif.



Q- What is the most modern line of refrigeration equipment for food processing plants-?

A.

costs less to own*

Now, from one manufacturer, Vilter, you can get a complete line of integrated, fully modern refrigeration equipment engineered to your specific food processing plant needs. Furthermore, by standardizing on Vilter equipment throughout your plant, you gain the benefits of sound engineering design that provides efficient performance and minimum maintenance, precise fabrication that guarantees reliable day-in-day-out service, and careful installation analysis that reduces plant operating expenses. When you buy Vilter you buy performance with built-in economy.

Whether for poultry processing plants, packing houses, dairies, breweries, bottling plants, frozen food processors and cold storage warehouses, among others, Vilter has the size and kind of fully automatic refrigeration equipment you need. From Multi-Cylinder and Vertical compressors that assure minimum power requirements per ton of refrigeration developed to Polarflake Ice Makers, Pakicers, Zer-O-Disc Fin Coils, Shell and Tube Condensers, Liquid Transfer Systems, Supercapacity Water Coolers, Verti-Bay Coils, Latent Heat Storage Systems, and many other units—Vilter can provide the custom designed answer for your refrigeration needs.

Consult with your nearest Vilter representative for a well-planned refrigeration or air conditioning installation.

* Savings in low first cost are not the complete answer when considering the installation of refrigeration equipment. But savings in terms of years of extra service, reliable performance and minimum maintenance—that's where Vilter excels in low-cost ownership.

QUALITY CRAFTSMANSHIP that lasts...

ENGINEERING DESIGN that guarantees performance

Vilter

REFRIGERATION and AIR CONDITIONING

THE VILTER MANUFACTURING COMPANY, Milwaukee 7, Wisconsin

Air Units • Ammonia & Freon Compressors • Booster Compressors • Bondalet Coolers • Water & Brine Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pipe Coils • Valves & Fittings • Pakice & Polarflake Ice Machines

However, their refrigeration plant could be classed among the grand-daddies in this field. Steam driven horizontal double acting compressors handle the refrigeration utility demands. Auxiliaries, for the most part are steam; both duplex and simplex pumps in the majority of applications, including the handling of liquid NH_3. The good operating condition of this machinery is a tribute to the firm's engineers and maintenance gang.

After the plant tour, our meeting was conducted in the new and fabulous Circus Room where a fine buffet meal was served through the courtesy of the Goebel Brewing Company. The visit to this modern plant and brewing facilities proved very interesting and no member went away without a greater knowledge of the centuries — old art of brewing high quality malt beverages. The time spent in Circus Room was most pleasant and many friendships were rekindled in its cozy, intimate atmosphere.

Detroit was honored with the presence of the National Secretary at this meeting. He made it a point to attend inasmuch as he had made a special trip to Detroit to assist our chapter officers in final arrangements with the Hotel Statler for the coming convention. The chapter took advantage of Secretary Kelahan's presence to realize a long desired ambition, that of having someone from National Headquarters conduct an initiation ceremony. Kelahan accepted reluctantly, explaining that this would be his first "solo", but the result matched most initiation ceremonies we have had.

Secretary Kelahan also gave a short talk relating to the general activities of the Association as a whole, which gave the members a better conception of what was being accomplished for their benefit. He also briefly outlined the task ahead for our chapter in the way of details and preparations for the National Convention to be held in our city this fall.

Kansas Charter Presented

PRACTICAL Refrigerating Engineers in Greater Kansas City officially affiliated with NAPRE on Tuesday, February 21, at a dinner meeting at the Holiday House, Kansas City, Kansas. Erecting, operating, maintenance and supervising engineer personnel in industrial refrigerating businesses in both cities, grouped together last year and petitioned for a Charter for the Kansas City area.

A Charter, granted by NAPRE's Board of Directors at Los Angeles Convention in November 1955, was presented by Ken M. Holaday, a Past President, and Utilities Distribution Engineer for Anheuser-Busch, Inc., of St. Louis. Assisting in the initiation of new Kansas City members, the presentation of the charter, and the installation of the Chapter's first officers were Geo. H. Koehne, another national past president and chief engineer, Tulsa Cold Storage Co., and Eugene Kessler, chief engineer, Plant No. 1, Falstaff Brewing Corp., the vice-president of St. Louis Chapter, NAPRE.

Officers of the Greater Kansas City Chapter are Leland Kenagy, chief engineer, Railways Ice and Service Co. Inc., president; V. M. Crocker, chief engineer, Federal Cold Storage, vice-president; John G. Muller, district engineer, Railways Ice and Service Co. Inc., secretary; David M. Grumbling, chief engineer, DeCoursey Creamery Co., treasurer. Greater Kansas City Chapter becomes the thirty-first metropolitan unit of NAPRE.

At the conclusion of a delicious fried chicken dinner, the chapter secretary took charge of the meeting and attempted to select a Master-of-Ceremonies for the proceedings to follow. Mrs. Leland Kenagy chose a number between one and thirty, and Mrs. Robert Clark then, in a game of honest John, began counting all of the members present to select the Master-of-Ceremonies. The number selected turned out to be that of the chapter secretary! A very brief history of NAPRE was given, and a story on the formation of the Kansas City Chapter. Among out-of-town guests introduced was Mrs. George Koehne, who accompanied her husband, from Tulsa.

At this point, the meeting was turned over to Past President Holaday, who, with the assistance of Past President Koehne and Kessler, formally initiated all candidates for membership, presented the Charter and installed the new officers. In carrying out these functions Holaday gave the chapter many fine pointers that go toward making a successful chapter.

After receiving the Charter, President Kenagy called on Past President Koehne who briefly outlined the benefits and advantages that can be derived from membership in NAPRE and charged each member with the responsibility of working hard for their own benefit as well as the benefit of the chapter. President Kenagy then called on H. W. Sumner, general manager, Federal Cold Storage Co., the make a few remarks on the behalf of management. Mr. Sumner pointed out the urgent need for trained refrigeration engineers in the industry, and expressed that there was no better place for training these engineers than in NAPRE.

Members V. W. Crocker, L. H. Farris and J. Schwab were asked to stand and were given the sincere applause appreciation from the entire group for the fine charter party they had arranged. A telegram of congratulations from Leroy Etzel, National President, was read. There was also a letter of congratulations from E. W. Woodruff, Kansas City Manager of Railways Ice & Service Company. Membership certificates and traveling cards were then presented to each member by Chapter President Kenagy.

As is customery in every NAPRE meeting, there was some discussion from the floor. The ladies were thanked for their attendance, and were invited to take part in the chapter functions as if they were full members. Mrs. Haskell Brown, speaking in behalf of the ladies, expressed their appreciation of the party and their desire to take part in future functions of the chapter.

Denver

MARCUS FLORIDA

INSTRUCTOR for our January meeting was Chapter Vice-Prexy, Al Nazarenus, who gave a very good resume of the chapter on refrigerants from Basic Refrigeration. We had a discussion on why certain refrigerants were best fitted for certain jobs and how to arrive at the right refrigerant for the application. Al told of some of the problems they had at his plant and how they were overcome. As usual we received a lot of good practical advice as well as technical material.

Our chapter members are now giving

Greater Kansas City Chapter officers show their pleasure at receiving an NAPRE Charter. Chet Rose, a charter member, posed the group around Leland Kenagy, the Chapter President, for the photo on the left. Center: Ken M. Holaday, a national past president, addresses the group prior to the chartering ceremony. National Treasurer Kenagy and Mrs. Kenagy are at his right and Gene Kessler, St. Louis vice-president is seated at his left. In the right photo, Past National President George Koehne has some choice words of encouragement for Greater Kansas City. Other officers of this new Chapter are: V. M. Crocker, Chief Engr., Federal Cold Storage Co. (City Products Corp.) vice-president; John G. Muller, District Engineer, Railways Ice & Service Co., Inc., (Div. of Southeastern Public Service Co.) Secretary; and David M. Grumbling, Chief Engr., DeCoursey Creamery, treasurer. Kenagy is Chief Engineer at Railways Argentine Station Plant.

serious thought to having a second meeting night a month given entirely over to instruction and maybe some plant tours. We have prospects for over twenty new members in the near future and will need to start a new class. The educational benefits in NAPRE are sure selling in Denver.

E. A. Froese, York Corporation, Denver Branch Manager, came in as an associate member. He brought along a film on York compressors which we highly recommend to be shown with classes on compressors. After the film, Froese told us of some of the latest developments in centrifugal compressors. They now make them up to twelve stages. A comparison was made with the extractions being made in steam turbines and what possibilities were ahead for operating one machine on several different evaporator temperatures from different compressors.

New members signed at the last two meetings are: Don Hannelbaum, Safeway; Joe Engel, Iron Fireman; John Berger, McCombs Refrigeration; E. A. Froese, York Corporation; Norman Phipps, Chief Engineer, Continental Baking Co.; Maurice Bryan, Capitol Packing Co., Guy Zellus, Engineer, Gates Rubber Company.

Memphis

CHAS. CONLEY

EVAPORATORS was the refrigeration subject discussed by Instructor H. L. Todd on Wednesday, February 1. Again, he put over his talk by having a compressor running connected to an evaporator. He demonstrated and explained the various types of evaporators; the type or kind best suited for the work to be done. John H. Robinson showed a colored and sound picture of "Missiles Used in World War II." He served refreshments at the meeting. Phil Rinn's name was pulled for the attendance award and he was there!

Gordon C. Wiggins, manager and engineer for the Carloss Well Supply Co. was elected to membership. This new member was gotten through the efforts of National Vice-President Frank Chase of New Orleans and C. W. Sullivan of Memphis. Carloss is celebrating their diamond anniversary, being in the well business for 75 years. Membership in the chapter has been held by one of their representatives almost consistently since Tennessee No. 1 was chartered.

Pittsburgh

OTTO KNOCH

ANOTHER honor was bestowed on Louis P. Mantz, officially, at the February 23 meeting of Pittsburgh Chapter, NAPRE. At that meeting, Chapter President, Alois Paulmier, read a letter from the national organization which explained that our own Louis P. Mantz is now a national honorary member of NAPRE.

At the board of director's meeting, following the 46th convention at Los Angeles last Fall, Louis was awarded his honorary membership by a petition submitted by Pittsburgh, Chicago, Detroit, Milwaukee and St. Louis chapters. Louis is a past national president, past president of this chapter, and for many years secretary of the chapter also. In 1953 he was cited by the then president, Alvis J. Clay, for more than 30 years of continuous membership in the Association. According to Louis it was a great pleasure to serve both the national association and the Pittsburgh chapter for so long a time.

Dallas

HAROLD KOUTNIK

PRINCIPAL item of business conducted by the Dallas Chapter on February 20 was the election of officers for the 1956 term. Several of our meetings have been cancelled by some very rough performances of mother nature which very effectively delayed the election. The new president is W. E. Weaver, vice-president, George Stewart, secretary, Frank Fackler and treasurer, Harold A. Koutnik.

Members-At-Large

FRANK CHASE

POSSIBLY a chapter may be realized this year in Canada. J. H. Vosburgh, who is chief engineer of Trans-Canada Freezers Ltd., at Lethbridge, Alberta, Canada, wrote, "The information you passed on is very enlightening as I did not know one could become a member-at-large. I know Bill and John Gomany, also three boys at the Lethbridge Brewery. At least two more vegetable freezer firms are

INSTALL
peak performance
INTO YOUR
compressors
(AIR · GAS · AMMONIA)

Peak performance, maximum efficiency, greater output, and lower power costs can be built into your oldest, and of course your newest, compressors by the installation of VOSS VALVES.

Check THESE
VOSS VALVE ADVANTAGES:

- Quiet, vibration-free operation
- 20 to 60% more valve area
- less power consumption
- minimum pressure loss
- normal discharge temperature
- lower operating costs
- utmost safety

Our detailed proposal for increasing the efficiency of your compressor will be sent you without obligation. Send us the name, bore, stroke, and speed of your machine.

J. H. H. VOSS VALVES
REG. U.S. PAT. OFF.

VOSS VALVES / J. H. H. VOSS Co., Inc.
785 East 144th Street, New York 54, N. Y.

getting into production in '56 and '57, and as we are doubling capacity this year, I feel that we could have a chapter formed by fall."

Perhaps some of our Canadian Brothers close to Lethbridge will be interested. If so, contact Mr. Vosburgh. He will be glad to hear from you.

In correspondence from J. A. Gealta, chief engineer, Becker Products Co. of Ogden, Utah, he indicates he would like to see an NAPRE chapter formed in his locality. If one is formed there (Ogden), he sees no reason why one could not be formed in Salt Lake City as they have more industry to choose from. He hopes to see us at the convention in Detroit. (Members-at-large in the Salt Lake City area please note! Won't you give a hand? NAPRE will be happy to give anyone assistance in trying to form a chapter.)

Latin American Brothers corresponding these days include Ricardo F. Redlich, Cass Teodora Harth, S. A., Lima, Peru, S. A., Rolando A. Diaz and Francisco Fernandes, W. M. Anderson Trading Co., S.A., Havanna, Cuba. Robert B. Brown, although he is a U.S. citizen, is now connected with Allied Industrial Services De Venezuela, Caracas, Venezuela, and might be considered in this category.

Good natured rivalry is taking place between several of the national officers and the Chicago Chapter. These officers want to reclassify Edgar F. Rutz as a member-at-large. He recently transferred from Chicago's Wilson & Co. plant to their newer plant at Cedar Rapids, Ia. These officers want to break his Chicago ties, hoping he'll get lonesome and start his own Chapter in Cedar Rapids. Looks as if they're losing to Chicago. Rutz writes:

"I really miss the regular meetings of the NAPRE. Although I hadn't been a member of the Chicago Chapter many years, I did meet and get acquainted with some very fine fellows. I appreciate receiving the monthly meeting notices and read through the lessons indicated in them.

"I don't know whether I would like to be a member-at-large, or hang on to the Chicago Chapter. I am rather proud to be a member of the Chicago Chapter and who knows, I may want to come back there some day. However, I do like Cedar Rapids, and I like my job here.

"Our plant here has a total of 1300 tons of refrigerating capacity of the compression type and 250 tons of absorption system. In addition to this we are now in the process of installing another twin Worthington, two stage machine, with a rated capacity of 422 tons. This machine will be driven by a 642 horsepower turbine.

"The turbine is a mixed pressure turbine, which will ordinarily operate on 150 lbs. psi steam and exhaust at 10 lbs. psi. When there is an excess of 10 lbs. steam in the mains, the turbine will automatically swing over and operate on 10 lbs. steam and exhaust at 25 in's., vacuum. This machine was shipped out here from Chicago."

John Pondish, member-at-large, in Korea with the Army, writes that his "whirlybird" (he is assistant crew chief) has had some distinguished passengers, including Cardinal Spellman, Billy Graham, and Marilyn Monroe.

(Continued on page 44)

NAPRE

Question Box

The National Educational Committee, NAPRE, answers monthly in this column, operating problems forwarded by members. The Committee appreciates answers from the field. Address questions and answers to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif.

Iron Deposits Clog System

QUESTION NO. 1099: Our well water leaves a heavy deposit of iron in our water pipes. What can we do to eliminate taking pipes apart to clean out the iron?—C.B., Mich.

ANSWER: The system can be cleaned with inhibited hydrochloric acid solution of 10 percent strength, or more. Whether to fill and soak, or circulate would depend on the nature of the deposit and the size and arrangement of the system. Other factors that would depend on experience and knowledge of the local situation are contact time and method of application.

How to prevent subsequent deposits after the system is cleaned is not a simple problem. The correct method cannot be prescribed without some knowledge of the plant and more complete data on the chemical character of the water.

Generally, the most effective method of iron removal is aeration followed by lime treatment, sedimentation, and filtration. An ion exchanger is sometimes indicated. These methods are economical in large installations, but could probably not be justified in the small plant except under extreme conditions. Probably the most practical treatment would be a glassy sodium metaphosphate dissolved and dripped or pumped into the supply line, or a specially processed low-dissolving material like Hall Laboratory's Micromet in a by-pass feeder inserted in the discharge line from the well.—K. M. Holaday, St. Louis.

Says Air Conditioning Plant Will Prevent Window Fogging

QUESTION NO. 1100: Our dry cleaner has his plant air-conditioned for summer comfort of his employees. A small branch duct serves his customer area. In the winter gas heater blower units serve the plant and customer areas. However, steam from plant operations condenses on the front and side windows, runs down the walls, and in general ruins the interior and exterior appearance of his building. I maintain that he can operate his air conditioning system all winter and reduce or eliminate the window fogging. His air conditioning man says the scheme is ridiculous. Care to arbitrate this argument?—Wm. R., River Forest, Ill.

ANSWER: Unless there are some unusual circumstances which are not mentioned in your question, there would be no point to operating the air conditioning system during the winter time. It is true that the air conditioning system will remove moisture from the air but nature itself does this very effectively for us in the winter time. The outside air would probably contain much less moisture than the discharge air from the conditioning unit.

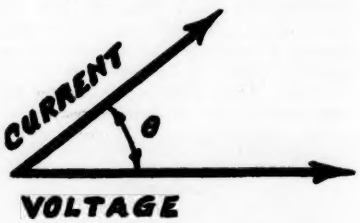
If it is imperative that you eliminate the fogging of windows, etc., you can do it by using large quantities of outside air for ventilation. This is very costly, however, because it adds heavily to the heating load. Another approach would be to take steps to raise the inside surface temperature of the windows and walls. Using double or triple glass in the windows, insulation in the walls, and blasts of warm air along the surfaces could be possible solutions. The windshield defroster in an automobile is a good example of solving the problem in an unusual way.—H. P. Hayes.

The Perennial Question On Power Factor Correction

QUESTION NO. 1101: Can you explain in a few simple words what power factor correction is, why it should be done, and how it can be done?—Q.B.C., Los Angeles.

ANSWER: When dealing with alternating current, it must be remembered that the voltage and current are not always in phase (in step with each other). Sometimes the current may lead the voltage and other times it may lag behind. Only the portion of the current which is inphase with the voltage produces useful power. Power factor is a measure of how much of the current which is flowing is in phase with the voltage.

In the sketch below, the amount of inphase current is equal to the total current multiplied by the cosine of the angle by which the current leads the voltage.



In this case, the power is equal to P = voltage × current × cosine θ.

In this illustration, more line current is flowing than is actually necessary to produce the given power. The extra current travels through the system without accomplishing anything. However, the extra current requires large transformers and larger wire sizes than are really necessary, so it adds needlessly to the cost of an installation.

Power companies therefore charge for this extra current even though it isn't doing anything useful for the customer. Consequently, it is advantageous for the customer to maintain a power factor of unity, which means that his line current and voltage are completely in phase.

Power factor can be corrected by introducing a current which will bring the line current into phase. For example, a plant with lagging power factor can install capacitors (which consume practically no power) and the capacitors will pull a leading current. The combination of the lagging and leading currents can be arranged to give a total line current exactly in phase. There are other methods of correction but this one example gives a general idea of what can be done.—H. P. Hayes.

Food Irradiation Begins To Worry Practical Men

QUESTION NO. 1102: I have recently seen a few newspaper stories about irradiation of foods. These stories say that radiation treatment of foods may some day replace refrigeration. I'm not really worried about this, but I am curious about it. Does it really work? Is it really the coming thing or is it mostly newspaper talk? —W.O'R., Chicago.

ANSWER: The February 1956 issue of Industrial Refrigeration (p. 25) contained a brief but interesting article on this subject. There is no doubt that all of the research now being done on the subject of irradiation will produce some interesting results. How far such results will go in replacing refrigeration is a question that even the experts hesitate to answer.

Basically, the point to using radiation is to kill the bacteria which normally would produce spoilage. To date, most of the tests have shown that complete sterilization of foods requires heavy doses of radiation which tends to destroy flavor and texture. However, a combination of radiation and refrigeration seems to hold great promise. The technique is to kill some of the bacteria by radiation and slow down the action of the rest by refrigeration.—H. P. Hayes.

Wants Review Of Reefer Oil Asks Handling Fundamentals

QUESTION NO. 1103: I have read so much lately about oil separation and the necessity of oil traps for certain refrigerants that I am starting to get confused. Can you go back to fundamentals and explain why the oil problem is so important to refrigeration and what happens if I don't handle it properly? I understand some refrigerants give more lubrication problems than others. Why should this be the case? How do I know when I should take special precautions? If there are some special things to watch for, I would sure like to know about them.—F.H., Los Angeles.

ANSWER: There seems to be no clear-cut answer to your question. One of the best available articles on this subject is Chapter 11 of the Air Conditioning-Refrigeration on Data Book, ASRE, 1955-56. The following remarks summarize part of the data provided in this reference.

1) Pay attention to the lubrication instructions provided by the manufacturer of the equipment.

2) The use of the halogenated refrigerants have made chemical stability and lower solvent power very essential in lubricating oils.

3) Moisture contaminated oils produce the same troubles that moisture introduced in any other way would produce.

4) The mutual solubility of oil and refrigerants varies widely with the type of refrigerant. When a refrigerant has little solubility for oil, oil does not return from the evaporator and oil separators are required in the discharge line.

5) Excess oil on the cylinder walls generally will be carried into the rest of the system and hinder heat transfer. Oil is a poor conductor of heat.

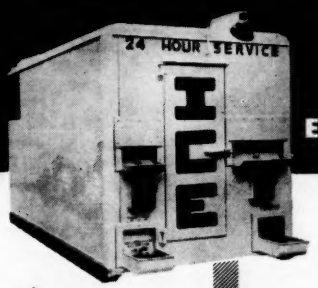
Reading of the above named reference for a good understanding of the refrigeration problems that can be encountered, is highly recommended.—H. P. Hayes.

New Questions

Seeks Cause Of Binding In Idle Rotary Compressor

QUESTION NO. 1104: What experience has the membership had with rotary boosters sticking, and hard to turn over (by hand?) while not in operation? What is the cause of it, and what do they do to correct the trouble?—C.G.B., Memphis.

S & S



ICE VENDING EQUIPMENT

NOW AVAILABLE

You can judge S&S by the customers it keeps

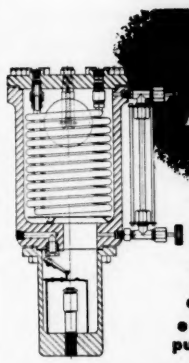
5 year Conditional Sales Contracts

Very Small Down Payments

True Lease — Costs You Nothing

Get full particulars now
Contact S & S agent near you

S&S VENDING MACHINE CO.
670 Lincoln Avenue, San Jose, California
Export Division Office: 326 Jackson St., San Francisco, Calif., USA

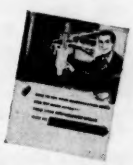


THE CLOSEST THING TO COMPLETELY AUTOMATIC PURGING THERE IS!

- Full automatic gas flow to condensing coil.
- Full automatic air discharge.
- No adjustments necessary during purging.

Armstrong forged steel purgers with automatic air and non-condensible gas discharge relieve engineers of guessing as to when the system is completely purged. Unit allows only non-condensibles to escape, saves on refrigerant.

Since no adjustments are required during operation, the engineer is free for other duties.



The purger can be operated continuously or intermittently. Send for free 4-page Bulletin No. 2211—Learn how Armstrong Purgers cut refrigeration costs, write:

ARMSTRONG MACHINE WORKS
860 Maple Street • Three Rivers, Michigan
Satisfaction Guaranteed

Better check on Armstrong High Side Floats and Liquid Seals, too!

Btu Gain In Small Discharge Given Up In Larger Header?

QUESTION NO. 1105: During a discussion of superheat a debate developed about probable effects of restricted discharge piping on a compressor's performance, and superheat and it's overall effect on the system. One member claimed to have observed during his experience with two identical compressors, one with adequate discharge piping and the other with severely restricted discharge piping, that the latter machine had a very considerably higher superheat than the former.

Another member expressed the opinion that though the machine's volumetric efficiency would suffer because of excessive head-pressure, he felt that the added superheat developed by the compressor in forcing the gas through the restricted discharge might be subsequently neutralized when the gas emerged into the common larger header and expanded to the lower head pressure of the other machine. It was his belief that the resultant cooling from this slight expansion of the discharge gas would very nearly equal the earlier gain in superheat occasioned by the extra compression work expended upon it by the machine with the restricted discharge.

We should like the opinions of other operators and engineers on this theoretical problem. We have no question about the advisability of providing discharge of ample size for all compressors, but the question of whether the gas will lose by expansion the heat gained by compression in nearly equal amounts. Such a situation interests us and we wish to know whose reasoning is most sound.

(From the above I believe it is clear that the two machines discharged into a common header leading to the condenser with adequate area for the flow of both machines, and it was at the confluence of the two streams of gas into this header of low velocity that the cooling of the gas from the restricted compressor would take place.) — A.F.D., Rio Grande.

Hermetic Insulation Fails

QUESTION No. 1105: We have a 7½ ton refrigeration package unit that has given us trouble. This unit is used in conjunction with several others to control temperature of business calculating machines. The business machines are hooded and the hot air is drawn into the cooling unit and the cooled air discharged into the room. The cooling units are semi-hermetics containing monochlorodifluoromethane.

Our trouble developed when the breakers kicked out and we discovered the motor windings had broken down. The operating pressures have been normal 58 to 60 psig on suction and 185 psig on the high side. The units are about 5 years old and they have never been opened or had an oil change. Would the oil break down and cause an insulation failure? What effect does monochorodifluoromethane have on motor insulation? — N.M.D., Chicago.

HP Per Ton of Refrigeration

QUESTION NO. 1107: Under the heading "New Refrigerating Machine Improves Performance" page 5, February I.R., it states that the machine is presently available for a tonnage rate of 240 to 410 tons. However, the motor ratings given are 250 and 300 horsepower. Now, I've always understood that a good rule of thumb for air conditioning applications is to figure one horsepower per ton of refrigeration effect. Has this manufacturer improved performance so radically that they get 410 tons of refrigeration with a 300 horsepower motor? To get 240 tons with a 250 horsepower motor, I can understand, but that 410 tons with a 300 horsepower motor is a little hard to swallow. Would you care to explain how they can produce the refrigerating effect claimed? — F.L.K., Detroit.

Truck Unit Anti-Frost Valve

QUESTION NO. 1108: An article "New Continuous Truck Refrigeration System" on page 4, February Issue, I.R., mentions an anti-frost valve on the blower coil. The article explains the function of this valve and its general operation in the system. Could you describe its detailed operation as a valve? — E.R.C., Chicago.

Merchants Refrigerating Builds New Warehouse in St. Louis

A LARGE refrigerated warehouse of The Merchants Refrigerating Co. at St. Louis, Mo., is now under construction at 8501 Page Blvd. by the Fruin-Colnon Construction Company. The building will have 1,300,000 cubic feet of freezer space. This new warehouse will have the distinction of being equipped with one of the larger radiant heating systems in the area. Still another unusual phase of the project involved hoisting into position a series of 120-foot trusses by a pair of cranes, believed to be the longest trusses erected in one piece in this area.

According to the builders purpose of the radiant heating system is to prevent heaving of the warehouse floor-slab due to extreme low temperatures within the building. The system will consist of a series of pipes, located in the structure's subflooring, that will circulate heated oil. Actually, the building will consist of a building within a building. Walls, ceiling and floor of the inner structure will be completely insulated. The inner flooring will consist of a double slab of concrete, separated with cork insulation.

Tilt-up construction is being used. This consists of pouring wall slabs in a horizontal position and then hoisting the precast slabs into place vertically. This relatively new method of construction is both efficient and economical. Absence of columns minimizes waste space and will permit efficient handling of merchandise in the refrigerated areas.

The warehouse will measure 430 x 260 feet, and a temperature of 10 degrees below zero will be maintained in most areas, by means of coils suspended from the ceilings. In the freezing tunnels, the temperature will range from 40 to 60 degrees below zero for "quick freeze".

Loading platforms will be enclosed to help maintain even temperatures. Automatic instruments and an alarm system in the engine room will record the temperatures and any fluctuations can be immediately detected and corrected.

A separate building adjoining the warehouse will contain about 450,000 cubic feet of refrigerated space and will be used for poultry and the handling and distribution of frozen foods. Office space will be arranged on the second floor of this building.

The Merchants Refrigerating Co. is operating a refrigerated warehouse at Lewis and O'Fallon streets, which will continue to serve the downtown trade of St. Louis.

Northwestern Storage Expands Plant

THE Terminal Ice & Cold Storage Co., announces plans for doubling its cold storage and freezing capacity at Woodburn, Ore. Work will begin at once on a building at the firm's plant on Silverton Rd. When the building is completed, early this summer, the operation will have more than a million cu. ft. of refrigeration space, enough to store 400 carloads of frozen foods.

Locker Plant Fire

A STUBBORN blaze, fanned by a high wind, swept through the Fleetwood Cold Storage locker plant at Cloverdale, B.C., Canada, causing $20,000 damage. When the first of three volunteer fire brigades arrived at the scene the building was already a mass of flames. Superstructure of the locker plant was gutted but the freezing room was still in good shape with thousands of pounds of frozen meat untouched by the flames.

OHIO SPECIAL ICE CANS

WELDED — RIVETED

ICE CAN GRIDS

Industrial Trucks

and Trailers

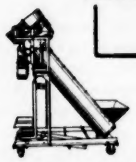
THE OHIO GALVANIZING & MFG. CO.

NILES — Established 1902 — OHIO

BALLARD ENGINEERED

ESKIMO

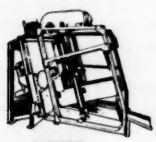
EQUIPMENT



WEIGHER- BAGGER

CRUSHER ELEVATORS

PAPER BAG SEWING MACHINES



CUBERS

CRUSHER- SLINGERS

ESKIMO CRUSHERS

POWER LIFT

MOBIL-ICER

COMPLETE SUPPLIERS TO THE ICE INDUSTRY

BALLARD Sales Co.

TEL. FOrtune 8474

P. O. BOX 1121
Fort Worth, Texas

Ammonia for Refrigeration means

BARRETT®

BRAND

Anhydrous Ammonia

CHEMICAL PROGRESS WEEK — APRIL 23-28

A Better America Through Chemical Progress

The name "Barrett" Brand is so well established by long usage and high quality that it actually *means* Anhydrous Ammonia.

Barrett Brand Anhydrous Ammonia means high purity—minimum 99.95% pure . . . it means dryness—free of water . . . it means sure valve operation at all times . . . it means fast, prompt delivery wherever and whenever you need it.

Barrett Brand Anhydrous Ammonia means it's the one refrigerant you can always rely upon—from a *local dealer* you can depend on.

Order Barrett Brand Anhydrous Ammonia today, in 150-, 100- or 50-lb. cylinders. Your local dealer is the man to call too if you want larger quantities, such as tank cars or tank trucks. Call him today.

First in Ammonia Since 1890

NITROGEN DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

Hopewell, Va. • Ironton, Ohio • Orange, Tex. • Omaha, Neb.

(Continued from page 40)

Seattle

JOHN GRAINGER

A DINNER meeting was held on Thursday, January 19, in the Orkilla Room of the YMCA. Bob Harrison, the Chapter Instructor, took us through the chapter on Evaporators in the Guy King Course. A lively discussion followed, most of the members contributing in some way to the general discussion. Two new members were initiated into the chapter; Donald J. House of Wrangell, Alaska, and John J. Flanagan of Rainer Brewery, Seattle.

Speaker for the evening was Bill Walsh of the Pacific Scientific Co., Seattle, who showed a film and gave a talk on Alco Valves. The various types of expansion valves were shown and the principle on which they worked were explained. There are in general practice: the hand-operated expansion valve, the constant pressure (automatic) expansion valve, the thermostatic expansion valve, and the solenoid valve.

The function of an expansion valve is to expand a high pressure liquid refrigerant into a wet gas mixture in exact proportion to the rate of evaporation in the evaporator. This was first accomplished with the hand operated expansion valve. The hand-operated expansion valve, however, has its limits as the setting has to be altered to suit load fluctuation: if the load increased the coils were starved; if the load decreased there was the possibility of flooding back.

The constant pressure (automatic) expansion valve was designed for the purpose of maintaining a constant pressure in the evaporator as the evaporator temperature is determined by the refrigerant pressure. The constant pressure automatic expansion valve is operated by means of a diaphragm having a spring under the diaphragm and another spring—an adjustable one—on top of the diaphragm. The pressure of the refrigerant in the evaporator pressure plus the tension of the spring acting under the diaphragm is balanced by the tension of the spring above the diaphragm. As the diaphragm is in equilibrium, any change in the evaporator pressure will cause the valve to either open or close. However, there is a limit in use of this valve as it operates satisfactorily where the load is more or less constant.

It is not suitable where there is a wide load or evaporator pressure variation. As the position of the diaphragm depends entirely on the evaporation pressure, if the load drops off sharply and the evaporator pressure is reduced the valve will open and so cause flooding; on the other hand, if the load is increased sharply the evaporator pressure rises and so lifts the diaphragm, and closes the valve just at a time when it is needed to be open.

The thermo-expansion valve was designed to take care of a wide load variation. The amount of refrigerant gas leaving the evaporator can be regulated since the thermo-expansion valve responds to (1) the temperature of the gas leaving the evaporator and (2) the pressure in the evaporator. The thermo-expansion valve operates on the principle that three forces are in equilibrium: (1), the pressure created in the power assembly by the remote bulb; (2), the evaporator pressure; (3), the equivalent pressure of the superheat spring. As the gas in the bulb is the same as the gas in the system, it is subject to the same pressure-temperature variation. Any change in the three forces acting on the valve will cause the valve to either open or close.

Solenoid valves are widely used in refrigerating work. They operate much the same as a hand operated shut-off valve except that they are electrically activated. The solenoid coil acts as an electromagnet when it is energized. Mr. Walsh made an interesting observation, when he stated that an automatic valve is not really a valve at all but a metering device. He further drew to the members attention the importance of correct selection of valve size and location of the control bulb.

Walsh advised members to consult accredited dealers rather than to rely on one's own calculations, as very often a small valve will do the same work as a large one and much more satisfactorily. An interesting point was a statement that four degrees of superheat will cause any make of automatic valve to run the full length of travel; i.e., from full open to closed.

Yakima

ELMER TOOP

OUR Meeting of February 15, with National President Leroy Etzel as our guest of honor, was very well attended. President Etzel spoke on the work his firm is doing, and what the NAPRE has done for him and can do for other men interested in the refrigeration and air conditioning field. Sorry we didn't take any picture; our big slip up of the evening.

His visit was enjoyed by all. Our meeting was held at the Yakima Valley Memorial Hospital. Thanks to Mrs. Harry Dodsworth who made up our sandwiches and helped her husband Harry line up the luncheon, which was held after the meeting in the hospital's dining room. Besides Dodsworth, E. A. Wahlstrom and Clarence Kuehnert did the serving of what we call a Dutch Lunch.

Green Bay

JIM SCHOUTEN

JANUARY 18 saw a change in command or leadership in Green Bay. Opening the meeting, President L. Bodart stated that we would have the election of officers which had been postponed from the November meeting at which time a storm had prevented many of the members being in attendance. Nominations were opened. For president, Amos Vierbicher was nominated; for vice-president, Leo Kusch; for secretary, J. B. Schouten; for treasurer, Verne Zimmer; for sergeant-at-arms, Hilary Lesperence, and Les Winkler was nominated to succeed the retiring member of the Board of Directors. Since there was no objection to the nominees named and no additional nominations, it was voted that all nominees be unanimously elected.

At that time Chairman Bodart turned the gavel over to the new chairman, Amos Vierbicher. The new chairman's first act was to call for a rising vote of thanks for the work of the retiring chairman. At this time Les Winkler volunteered a report on his trip to the National Convention in Los Angeles. Les' report covered several subjects such as dues, advertising solicitation, the educational fund, questions sent in by various chapters and the choice of next year's convention location. Of particular interest was a subject which Les got into apparently more or less informally and this was the reclaiming and reuse of oil in refrigeration systems. His remarks prompted further discussion at our own meeting with the result that several of the men were of the opinion that this subject would well deserve more looking into.

At this time the new chairman asked the secretary to lead the discussion on the instruction course. This was begun with discussion on refrigerants following where the last meeting had left off, discussing water as a refrigerant. After the alloted time, the chairman called the discussion period to an end. Green Bay accepted into the membership three applicants who were Dennis Huser, William Bero and Raymond Francken. These men were received and welcomed into the organization by the new chairman.

The meeting on February 15, was called to order by President Vierbicher. The usual order of business was suspended to let the program committee put on their program first. Program Chairman Harvey Wishart then introduced William V. Richards, a member and chief engineer of the H. A. Phillips Company of Chicago, manufacturers of refrigerant control devices and systems. Richards gave a fine talk on the type of controls, systems for liquid return and liquid recirculation, and answered several questions from the floor.

At this time the president called the attention of the group to the necessity of having a suitable blackboard for the organization. The boys from Consolidated Badger Cooperative volunteered to build a stand for this board, which purchase was authorized. A newly elected member was introduced to the group. His name is William Anderson who is an operator at the Liebmann Packing Company.

Under the heading of new business Les Winkler called attention to a suggestion made by some members of the Chicago Chapter that we, Milwaukee and Chicago consider having some kind of an outing together later on in the spring at some central point that would be convenient for all. Since there was no urgency attached to a decision on this it was decided to think about it for a month or two. Jim White then lead the discussion course and covered the subject of ammonia as a refrigerant.

Milwaukee

"ANDY" ANDERSON

MILWAUKEE Chapter, NAPRE, held its January meeting in Bradley Hall at the Milwaukee School of Engineering. The educational session was held from 7:00 to 8:00 p.m. with John Alberte officiating. The chapter covering various types of condensers was studied. Speaker of the evening who succeeded Alberte on the rostrum, was Clark Fochler of the Sporlan Valve Co., Chicago, who gave

Another history making KRAMER *manual*

full information of the NEW

KRAMER L THERMOBANK

An exhaustive and fully documented manual of automatic defrosting for temperatures from plus 32° to minus 75°—complete with rapid selection tables.

RESERVE your copy of Manual TV-320 now!

KRAMER

KRAMER TRENTON COMPANY
Trenton 5, New Jersey

an interesting talk on thermostatic expansion valves, covering theory and practical application. Descriptive slides were shown of various type evaporators and coolers.

The business meeting was called to order by Chapter President, E. Pat Kelly. A letter was read by Mr. Kelly pertaining to the appointment of Vincent Noll to the National Educational Board. A motion was made by Bud Tondreau that the chapter have more social meetings to inspire interest. A committee of four is to be appointed to investigate the scope and promise of holding an area conference in Milwaukee for the spring of 1957.

Final item of business carried was a motion by John Alberte that a chapter letter be forwarded to Milwaukee's Mayor endorsing Jerry Mierendorf as nominee to the post on the board of license examiners for power plant engineers.

Illinois Ice Association Annual Meeting

THE ANNUAL meeting of the Illinois Association of Ice Industries will be held at Langenfeld Hotel, Centralia, Illinois, Friday, April 16, opening at 10:00 a.m. Reports will be received from the officers; officers and directors will be elected, and plans will be made for the activities and management of the Association for the ensuing year.

City Products Increases Quarterly Dividends

DIRECTORS of the City Products Corporation increased the quarterly common dividend to 62½ cents a share, from the previously announced 50 cents declared on January 24. Payable and record dates were the same as previously announced, March 31 and March 12, respectively. This action restores the $2.50 annual rate that had been in effect for seven years prior to last June when the stock was put on a $2. basis.

Fire Destroys Cold Storage

FIRE destroyed the Western Cold Storage Warehouse at Moses Lake, Wash. Damage estimates ran as high as $250,000. The blaze was out of control when firemen were called at 8:35 pm. The warehouse was a total loss by the time flames were quenched an hour later.

New Ice Cream Plant

CONTRACTORS have been invited to bid on construction of an ice cream plant in Medford, Oregon for Jorgensen's Dairy Products Co.

Chicago Office Building To Be Air Conditioned

A FIVE million dollar air conditioning project for the Field Building, 135 So. LaSalle St., Chicago, has been announced by Field Foundation Inc., owner of the 45-story building. It involves half of the fifth floor and the sixth through the 44th floor or a total of 800,000 square feet of space.

The lower four floors were air conditioned when the building was erected in the early 1930's and half of the fifth floor has been conditioned since then. The 45th floor contains elevator equipment. Four penthouses will be built on the roof at the 24th floor setback and another to house fans and other machinery for the system.

Refrigerated Garbage

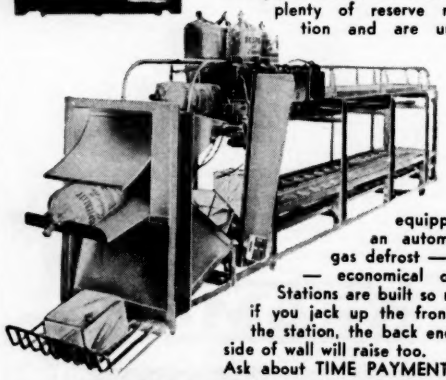
THEY'RE refrigerating garbage at Miami Beach these days. At least one new resort, the ocean front Chateau, utilizes a cold storage room to prevent refuse odors from offending guests. A steel door provides entry for collectors, making their daily rounds.

Perfection Makes Complete Automatic Vending Stations, Vault Vendors and Stationettes

Let Us Engineer Your Problems for Lower Cost Operation and Higher Efficiency

Completely Automatic — 24 Hour Service

The complete Ice-A-Teria station and engine compartment are mounted on three 5" I-beam skids with a 1½" pipe located crosswise at front and rear of these beams for ease of loading and unloading. Manufactured in standard sizes of 8x18, 9x20, 9x24, or built to customer's specifications. All stations have plenty of reserve refrigeration and are universally



equipped with an automatic hot gas defrost — efficient — economical operation. Stations are built so rigid that if you jack up the front end of the station, the back end of that side of wall will raise too. Ask about TIME PAYMENT PLANS.

Write for folder on Bagger-Weigher, Model 300 and 1500

PERFECTION Ice Scoring Machine Co.

P.O. Box 2140
Fort Worth, Texas

BOWER

BB BRAND

AMMONIA

Anhydrous Ammonia

OVER A CENTURY OF SERVICE IN CHEMICALS 1855 - 1956

PROMPT SHIPMENTS AND PURITY OF PRODUCT ARE TWO GOOD REASONS FOR SPECIFYING BOWER BRAND

HENRY BOWER CHEMICAL MANUFACTURING COMPANY

29TH AND GRAY'S FERRY ROAD
PHILADELPHIA 46, PA.

Frozen Foods For Arabian Desert

(Continued from page 24)

inder. As discharge temperatures increase over safe limits, the bulb sensing this heat rise, opens the TX valve, which increases the flow of liquid freon through the valve and into the interstage manifold, cooling the gas at interstage pressure.

As an example of the reasoning used to select two stage compressors we can examine the operation of single stage and two stage freon-12 machines by Plotting on Mollier charts, which will display the conditions that would develop.

For our example the compressors were selected to operate at minus 13 F suction temperature and 140 F condensing temperature which corresponds to 17.93 psia and 220.3 psia respectively. In charts 1 and 2 let us use as our operating pressures 18 psia and 220 psia and finding our compression ratio by dividing the discharge pressure by the suction pressure.

$$\frac{220 \text{ psia}}{18 \text{ psia}} = 12.2 \text{ ratios of compression}$$

Comparing these limits on our charts it is readily apparent that a two stage system reduces the final discharge temperature as well as the power requirements for the same capacity. It has been assumed that the process is adiabatic, causing the compression curves to follow a line of constant entropy. The gas is in a dry and saturated state at the start of compression.

Here then, sound judgment is outlined and for refrigerated railroad cars operating in extreme high ambients, many points must be foreseen. Points such as the danger of high discharge temperatures which can cause oil to carbonize in the heads and discharge valves sticking and breaking after a short time. Danger of cylinder scoring and poor lubrication in the upper portions of the cylinders, can also be caused by extremely high temperatures. These physical difficulties developing in compressors working with high compression ratios and temperatures are the reasons why two-stage operation has been favored over the conventional single-stage system.

First reports from exhaustive tests carried out in Saudi-Arabia by Aramco engineers indicate that these cars are performing above expectations and are the first of many that will be put into this specialized service.

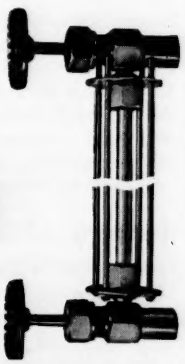
Canadian Warehousemen Annual Meeting

THE Canadian Warehousemen's Association will hold its 36th Annual Convention at Digby Pines, Nova Scotia, from July 2 to 5 inclusive. The CWA brings together operators from the refrigerated storage industry, the household goods moving and storage business, and from the merchandise storage and distribution field. A number of divisional sessions will be held to review specific problems related to the three separate interests, as well as general meetings of interest to all groups. In addition to strong industry representation from Canada, the CWA Conventions attracts excellent representation from the United States and some attendance from Europe.

Southwestern Spring Meet

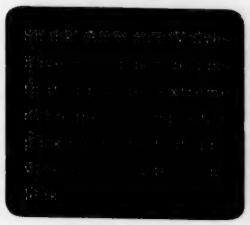
THE spring sales meeting of the Southwestern Ice Manufacturers Association will be held at the Roosevelt Hotel, Waco, Texas April 19 and 20, starting with an afternoon session Thursday, April 19. These meetings bring to the interested managers and supervisors the latest information.

SHANK
AMMONIA
VALVES
Well Engineered—
Precision Built—



ALL-STEEL GAUGE SETS
with automatic shut-off of liquid in case of glass breakage.

RELIEF VALVES
for Ammonia and Freon. Positive relief action. Pressures from 75 to 300 lbs.



Largest line of Ammonia All-Steel Bar Stock Valves in the industry. Completely Cadmium plated.

STOCKED BY LEADING JOBBERS

Write for Catalog and Prices. CYRUS SHANK CO. 4650 West 12th Place Chicago 50, Illinois

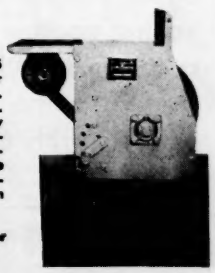
Bateman Makes Efficient Low Cost Ice Crushers For Every Purpose

Long life dependability is built into every Bateman Ice Crusher

Heavy duty Monarch model 50. Grinds 50 pound block of ice in six to ten seconds. $250.00, less motor.

Regal Model 25. For platform sacking or paper bags or general use. $160.00, less motor.

Bateman 25 CROWN. Ideal for Ice Stations . . . Vendors . . . Small Store. Only $130.00 (including 1/3 HP motor) Available with Wall Brackets or Platform Legs.



SEE YOUR DEALER or WRITE FOR INFORMATION

Bateman Mineral Wells, Texas
Ice Processing Equipment

REDUCE REFRIGERATION LOSS . . .

with PREST-O-MATIC®

ELECTRIC COLD STORAGE DOORS

Users report open-door time reduced up to 75% with PREST-O-MATIC doors—resulting in substantial refrigeration saving and maintenance of lower temperatures. Traffic moves through doorways quickly, safely. Open-pass through-close door cycle is completed in 8-10 seconds and more goods are handled in fewer man-hours.

PREST-O-MATIC doors are packaged, complete units, easily installed against opening without loss of of floor space. Full width of doorway is usable. Send for complete information or consult your architect.

FINE DOORS SINCE 1878

CLARK DOOR COMPANY

506 Hunterdon St. Newark 8, N. J.

Increase in Food Production Expected in 1956

PRODUCTION increases ranging from 7 to as high as 40 percent over 1955 output are predicted by major perishable food firms in a report just published by the National Association of Refrigerated Warehouses. The report, entitled "The 1956 Business Outlook for Public Refrigerated Warehouses," shows the "pacesetters" to be the frozen food producers. Continuing their dramatic growth, almost all frozen food firms reporting foresee increases in their 1956 volume.

The National Association of Frozen Food Packers said "volume of frozen foods should increase somewhere between 15 and 20 percent with the greatest percentage increases in meats, meat pies, and other specialty items." Frozen food distributors, according to the National Frozen Food Distributors Association, expect a 10 to 15 percent across-the-board increase in sales as compared to 1955. NFFDA pointed out, however, that it expects the largest of the seasonal packs, orange juice, to be held down by a short crop in Florida and 1956 orange juice sales will be only slightly ahead of 1955.

The American Meat Institute expects meat production to hit a new high in 1956, with a tentative estimate of 27.4 billion pounds. This quantity, however, exceeds only by 1 percent the previous record of 27.0 billion pounds produced in 1955.

The Refrigeration Research Foundation emphasizes in its comments on "The Research Picture" that "Researches over the past 25 years have established ways and means to produce superior foods by application of the freezing process, without undue or unreasonable increase in costs."

Commenting further, on research being done on food preservation processes competitive with refrigeration, TRRF said: "Large expansion of research in recent years on treatment of foods, feeds, and other substances with rays of various kinds has not supported widely publicized speculations that a way would be found to preserve foods without either refrigeration or canning. "However," the Foundation added, "very low levels of radiation offer promise as aids in the preservation of foods by refrigeration, by which the present day storage life of perishable foods could be extended."

Turkeys in Storage

INVENTORY figures on classes of turkeys in storage on January 31 have been released by the Institute of American Poultry Industries. The semi-annual report, said Dr. Cliff D. Carpenter, president, was compiled from figures received from 319 warehouses (compared with 190 last year), members of the National Association of Refrigerated Warehouses. The reporting warehouses are located in 212 cities in 43 states. An additional 75 warehouses reported no turkeys in storage (compared with 55 last year).

A total of 71,061,477 pounds of turkeys in storage was reported. This does not include any turkeys held in other public warehouses. Of the total tonnage reported, 70,315,290 pounds were classified. The unclassified tonnage (746,187 lbs.) was held in 13 warehouses (compared with 1,429,134 pounds unclassified held in 14 warehouses in the 1955 report).

Eviscerated hen turkeys comprised 17.44 percent of the total classified stocks this year compared with 18.16 percent a year ago. Eviscerated tom turkeys totaled 74.32 percent, up from 72.42 percent in 1955. Eviscerated broiler-fryer type turkeys were 5.15 percent, up from 3.73 percent the previous year.

New Passenger Ships Have Air Conditioning

A LUXURIOUS passenger service between New York and the east coast of South America will be provided by two new Moore-McCormack liners, scheduled to be completed late in 1957. Ingalls Shipbuilding Corp., Pascagoula Miss., has the vessels under construction. Among many new features incorporated in the design of these ships to provide maximum comfort and safety for passengers and crew as well as maximum efficiency in operation, is a 600-ton air-conditioning plant.

These Moore-McCormack liners will have a passenger capacity of 553 each, all in first class. All passengers and crew spaces will be air conditioned and these will include all staterooms, public spaces, beauty shop, gymnasium, and even the dog kennel. To provide draftless air distribution, the conditioned air will be discharged at low velocity through minute perforations in the ceiling of passenger quarters, as well as public spaces. Diffusers will be used in the crew's quarters.

S. W. Brown, New York City Consulting Engineer, associated with the engineering and design of ship air conditioning and refrigerating systems for the past 15 years, has been engaged by Moore-McCormack. His duties will be to review the Ingall's calculations and design and advise Moore-McCormack of their adequacy. Ingalls own engineering offices will prepare both the basic and detail drawings, as well as those used for construction.

Refrigeration is by two York Corp. 300 ton "Turbomatic Water Cooling Systems", Model L-95-28A2-38-A4. These will operate with trichloromonofluoromethane ("Freon-11" or "Genetron-11") refrigerant. Chilled water will be circulated to the various fan rooms where it will be utilized for cooling of the air. Individual terminal heaters will be located in each room and will act as a reheater during the cooling season and boosters during the heating season. Individual thermostats in each stateroom, regulated by the passenger, will control the flow of hot water to this heater, and thereby give each stateroom individual control. This applies to both passenger and crew quarters. Temperature control equipment will be Minneapolis-Honeywell, standard Marine Pneumatic type.

COMING CONVENTIONS

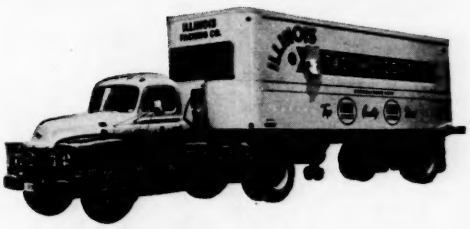
AMERICAN WAREHOUSEMEN'S ASSOCIATION
April 9-13, 1956
Hotel Statler, Los Angeles, Calif.
Wm. Dalton, Secretary

NATIONAL ASSOCIATION REFRIGERATED WAREHOUSES
April 9-13, 1956
Hotel Statler, Los Angeles, Calif.
Wm. Dalton, Executive Vice President

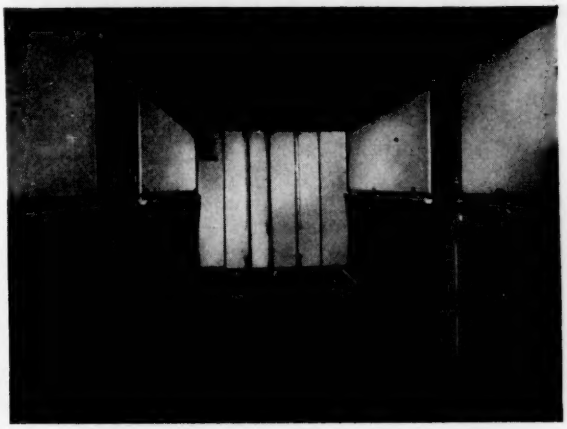
NORTHWEST ASSOCIATION OF ICE INDUSTRIES
April 11-13, 1956
Benjamin Franklin Hotel, Seattle, Wash.
F. Marsh, Secretary

SOUTHWESTERN SPRING MEETING
April 19-20, 1956
Roosevelt Hotel, Waco, Texas
P. A. Weatherred, Counsel

CANADIAN WAREHOUSEMENS ASSOCIATION
July 2-5, 1956
Digpy Pines, Nova Scotia
H. Cecil Rhodes, Managing Director



Cold-Cel TRUCK PLATES
Engineered to Maintain Any Temperature



In sizes to fit any application. May be installed in a horizontal position suspended from the ceiling, in a vertical position along the walls, or as a partition. Can carry eutectic solutions ranging from −59° to +26°.

In standard thicknesses and connections: 4-Connection 2⅛" and 2⅝"; 3-Connection 1½"; 2-Connection 1".

LOOK FOR THIS SIGN ⬭ FOR BETTER REFRIGERATION

DOLE REFRIGERATING COMPANY
5958 NORTH PULASKI ROAD, CHICAGO 30, ILLINOIS
103 PARK AVENUE, NEW YORK 17, N. Y.

In Canada: Dole Refrigerating Products Limited
44 Elgin Street, Brantford, Ontario

Write for "Cold-Cels in Action" — a pictorial brochure — or Engineering Catalog CE.

Maximum Refrigeration Efficiency
DOLE
THE Cel LINE

Cold-Cel TRUCK PLATES

Modern Processing Plant

(Continued from page 19)

scale check pallet loads. Process water is furnished by a 75 hp deep well turbine and a six-by-eight side suction pump. Waste water and trash are pumped by a bladeless pump. Contaminated process water is piped and pumped to spray fields by a two-inch pump. Circulating water is pumped to and from the concentrators by eight-inch units. Chlorination booster pumps are used, as is the boiler feed pump. Wash-down spray water is boosted by an F-M builtogether. Other equipment includes axial air gap, motor gears, open motors, splash-proof motors, synchronous motors and DC motors in sizes up to 450 horsepower.

Food Technologists Keep Eye on Radiation

(Continued from page 3)

Container Institute for the Armed Forces which has as a major objective the elimination of these side effects.

A fact of much interest, it concludes, is that the Surgeon General's office and the Federal Food and Drug Administration continue to hold a tight rein on the situation from the public health standpoint.

DEATHS

John T. Williamson

THE DEATH of John T. Williamson, former operator of The Cataract Ice Company, Niagara Falls, N.Y. occurred recently. He was 83, and had been a prominent business man in Niagara Falls for more than 60 years. During his long business career, he had operated the Cataract Ice Co., served as treasurer of the Bellevue Theater Corp. and had been a member of the board of trustees of the Niagara County Savings Bank for 50 years.

Born in Hamilton, Ont., January 4, 1872, Mr. Williamson came to Niagara Falls in 1891 to take over the management of The Cataract Ice Co. He headed this firm until his retirement, March 1, 1937. He became associated with the Bellevue Theater Corp. in 1920 and continued an officer until the corporation was sold to other interests last Fall. He was named to the Niagara County bank board in 1905, 10 years after the founding of the institution. He served for many years as chairman of the executive committee.

Walter M. Sandholt

PACIFIC Coast Refrigeration and Engineering industries learned early in March of the death of Walter W. Sandholt, retired, York Corp., San Francisco. He passed away in the St. Francis hospital, San Francisco, on Sunday, February 26, at the age of 68.

Mr. Sandholt first started in the refrigeration business in 1911 with United Iron Works, Oakland, Calif., former York Agent. After spending several years with this firm in the design, estimating and drafting work for refrigeration applications, he then went with the old York California Construction Company in July 1916, assuming like engineering duties. He continued with this San Francisco firm as an Engineer and Sales Representative through 1927 when the York Ice Machinery Corporation assumed control of the company. He continued with York until October 1954 at which time he retired.

Mr. Sandholt was a charter member of California Chapter No. 1, NAPRE, serving as the chapter's first secretary. In 1952, he served as chapter president and in 1953 was cited for his outstanding service. He was also an ASRE member.

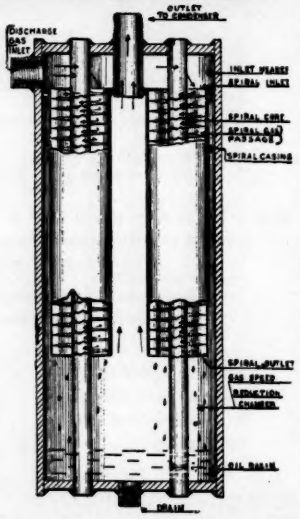
"KING ZEERO" OIL SEPARATOR

Stops oil from entering condenser receiver and low side

Allows operation as originally intended. Simple in operation — no parts to wear out — no screens, metal wool or any close screens to clog, raise discharge pressures and cut down capacity.

When used in connection with air compressors, water is also separated with the oil.

Made in 12 sizes, ½" to 6".



Built for years of trouble free service. Mechanical details on request.

THE KING ZEERO COMPANY
4300-14 W. Montrose Ave., Chicago 41, Ill.

Now most businesses require refrigeration!

Whether you manage an ice rink or a restaurant, mechanical cooling plays a vital part in your operations. Today there's hardly a business or industry that doesn't benefit either from air conditioning, ice making, quick freezing, or other refrigerating work.

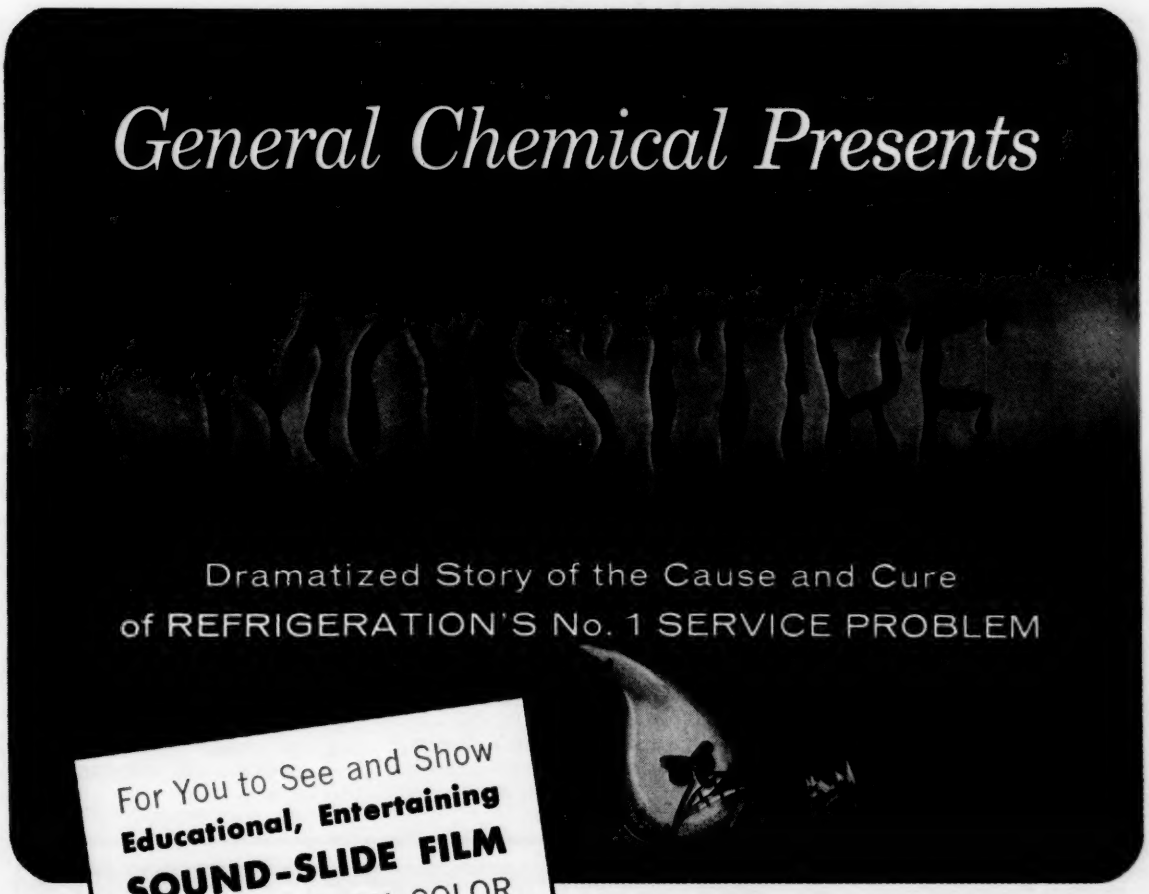
Get this engineering booklet now

Frick Bulletin 80-D, just off the press, tells about the industry's most versatile and complete line of commercial and industrial cooling equipment—the line with nearly 75 years' experience built into it.

Write for a copy of Bulletin 80-D on your company letterhead, and tell us what cooling work you wish to do.

FRICK CO.

General Chemical Presents


Dramatized Story of the Cause and Cure
of REFRIGERATION'S No. 1 SERVICE PROBLEM
For You to See and Show
Educational, Entertaining
SOUND-SLIDE FILM
IN FULL NATURAL COLOR

* Prepared under the technical direction of DR. WALTER O. WALKER, "Genetron" Consultant and Dean, Division of Research and Industry, University of Miami.

A Full Report Highlighting

- **Sources of moisture in refrigeration systems.**
- **Problems and damage caused by moisture.**
- **Recommended methods for removing moisture.**

Here's information of real practical value to the air conditioning and refrigeration service engineer . . . a sound-slide film prepared by General Chemical to help you handle the problem of moisture in refrigeration systems.

"Moisture" is a swift-paced, 35-minute sound-slide film in full natural color. It is instructive, informative . . . gives authoritative, up-to-the-minute information on every phase of the costly moisture problem.

Full of "how-to-do-it" topics! Covered are: how moisture gets into the refrigeration system and how to keep it out; the problem of "freeze-ups" and its solution; the causes of corrosion; how moisture reacts to form destructive acids and sludges; how insulation breakdown and motor burnouts are related to moisture; sound practices for care in the field; how to purge moisture from the refrigeration system; how to dry out a system with or without an oven; facts about desiccants, etc.

Refrigeration Service Engineers Society Members are invited to show this film at their chapter meetings.

Refrigeration and air conditioning wholesalers, equipment manufacturers, and contractors are invited to make full use of it in briefing their organizations on moisture control, and to show it at meetings for customers. Also available to technical schools and colleges offering refrigeration courses.

FREE! Send coupon for loan of full-color print and record. Free prints also available on long term or permanent basis; write for particulars.

"Genetron" Department
GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

Without cost or obligation, I would like to have a print and record of "Moisture" on loan for showing (state preferred dates) _____

☐ If you do not have a sound-slide projector, check here and a General Chemical representative will arrange a showing for you.

Name _____

Position _____

Company _____

Where film will be shown (chapter meeting, staff meeting, etc.)

_____

Street _____

City _____ Zone _____ State _____

News of People

Carlson New President City Products Corp.

A. R. Carlson

ELECTION of A. R. Carlson as president and W. F. Zeidler as executive vice-president and treasurer of City Products Corporation has been announced by William J. Sinek, chairman of the board and chief executive officer. Carlson was a former vice-president of the company and president of the NAPRE in 1952, and Zeidler was vice-president and treasurer of the company.

In announcing the promotions, Sinek recalled that at the April, 1955 shareholder meeting the office of chairman of the board had been created and designated as chief executive officer of the company. The changes, he said, carried out his announced policy to give more recognition to the top management group in the company.

Sid Rogers Appointed Alford Vice-President

Sid Rogers

SID ROGERS, who retired January 1 as head of Swift and Company's storage department, joined Alford Refrigerated Warehouses at Dallas this month as vice-president in charge of research, President Fred F. Alford has announced. Mr. Alford said that Mr. Rogers' vast understanding of storage procedures and problems will be of invaluable aid to Alford's, which, while already one of the largest installation of its kind in the world, is currently undergoing expansion.

Mr. Rogers, who started with Swift in 1909 as a laborer and clerk at an icing station in Manchester, New York, headed up Swift's storage operation in the United States and Canada for the last 15 of his 46 years of service with the big meat packing concern. At the time of his retirement he also was vice-president of the Hammond Warehouse Company of Chicago, Ill., and was vice-president and a director of the North Warehouse Company of Somerville Mass., both divisions of Swift and Company.

From 1944 to 1953, he was a member of the cold storage advisory committee to the United States Department of Agriculture, representing the meat packing industry. He was on a similar committee during the era of price controls and also served with such a group advising the research division of USDA.

He still holds the office of treasurer of the presently inactive American Institute of Refrigeration, which for several years acted as a liaison agency between the refrigerated warehouse industry in this country and that in Europe, before World War II.

Sid's late father, Alonzo M. Rogers, joined Swift and was an agent at Manchester for 37 years. Sid Rogers also has a son in the cold storage business — Robert F. Rogers, who is manager of the Badger Cold Storage Company of Milwaukee. Wisc.

Said Mr. Rogers of his new job — the second one he ever had:

"I am proud to be associated with Alford's. As storage department head for Swift and Company, I was charged with responsibility of approving the use of warehouse space all over this country and Canada. I got around, had to know warehouses, and the men who run them. Thus I have known Mr. Alford for many years, and I rate him right up at the top in the industry. "A progressive thinker, he had the vision and know how to create. The fabulous Alford Refrigerated Warehouses here in Dallas are the result."

ANDREW R. CURRENT, City Products Corporation, Chicago, has been appointed a member of NARW's Executive Committee to succeed R. C. Muckerman. Mr. Muckerman recently resigned from NARW's top policy group because of a marked reduction of his activity in the cold storage industry. Mr. Current is a long time Industry veteran and has been prominent in cold storage affairs for many years.

MANUFACTURERS' NEWS

Pittsburgh Corning Appointments

THE appointment is announced by Hubtion announces the appointment of E. J. Barnell as manager of Foamglas Low Temperature Sales effective February 1. Mr. Barnell, who has been associated with

E. J. Barnell

H. B. Waldo

Pittsburgh Corning since 1948 as a sales representative in various locations including Indianapolis, San Francisco and Atlanta, will be in charge of sales of the company's cellular glass insulation, Foamglas, in all refrigerated applications. He will be located in the firm's headquarters offices, One Gateway Center, Pittsburgh 22, Pa.

H. B. Waldo has been appointed sales representative in the Wisconsin Minnesota area. He will supervise the distribution and sales promotion of PC glass blocks, Foamglas building insulation and Foamglas low temperature insulation. Mr. Waldo, a graduate of Michigan State College, was formerly a Pittsburgh Corning representative with headquarters in St. Louis. He succeeds H. S. Baut who has been appointed manager of Pittsburgh Corning's Philadelphia district office. Mr. Waldo will be located at 4049 North 84th Street, Milwaukee, Wisconsin.

Canadian Representative Announced by Hubbell

THE appointment is announced by Hubbell Corporation, Hawley Road, Mundelein, Illinois, manufacturers and designers of automatic back pressure regulators, solenoid valves, safety valves for refrigeration, air conditioning and industrial application, of Jenkinson & Company, Ltd., 1025 Weston Road, Toronto, Canada, as their exclusive sales representative for the Dominion of Canada. Jenkinson and Company will carry a representative stock of Hubbell controls and accessories, as well as a stock of repair parts available to the trade.

Vilter Recovers From Slump of Decade Ago

THE CRITICAL ills of a decade ago of the Vilter Manufacturing Company have disappeared according to an informal report of the company's directors, published in a recent issue of The Milwaukee Journal.

The 89 year old company was in financial trouble in 1945 when the stockholders pulled out. With them went $1,300,000, more than two-thirds of the firm's total net worth at that time. Remaining was a net worth of $502,000 against a total debt, composed of bank loans and income tax claims, of $2.264,000. The company was plagued with labor-management strife, and employee morale was at rock bottom. Eight months after the stockholders withdrew, the firm was hit by a strike that lasted six and a half months.

But the company's new management managed to keep the firm going. Slowly over the years that followed, creditors, plus accumulated interest were paid off. Today Vilter doesn't owe a cent except normal trade obligations, according to A. A. Silverman, president. The company's net worth has climbed 300 per cent above the depths of 1945, it is even higher than it was before the stockholders left. As of July 31, the close of the last fiscal year, the ratio of total current assets to total current liabilities was approximately 4½ to 1, a complete reversal of what it was 10 years ago.

The Vilter Co. stands as an oddity of corporate structure. There is no stock and no owner in the sense of any one individual or group of individuals. The firm owns itself. The structure is similar to that of a church. Instead of stockholders, the company has "members", who elect the directors, who, in turn, elect the officers. New "members" can be elected or unseated by a majority vote of the current membership. The total membership is limited to five. Four of the company's five officers constitute the present board of directors and the membership. Profits can be put back into the company for expansion and modernization or can be donated to research groups for the development of new refrigeration and air conditioning methods and equipment. None of the profits can go to any member or official of the company beyond his individual salary, and in the case of dissolution of the firm, any proceeds must go to research. This strange corporate set up is the result of the stockholders' withdrawal in 1945. Prior to that time, Vilter was a regular stock corporation, closely held by the founding family and its heirs.

The sale and subsequent retirement of the stock was done in an unusual manner. Instead of selling the company to outside buyers, a non-profit, non-stock company known as Foundation, Inc., was organized through a complicated legal process to take ownership of the company.

Then the stockholders sold their stock to Foundation Inc., which in turn retired the stock. The payment, taken from Vilter funds and acquired in part through mortgages, was $1,300,000. Management of the firm was given to a team of employee managers headed by E. B. Tilton, who had been the firm's executive vice-president, general manager and treasurer. Sometime thereafter, Foundation, Inc., was dissolved and Vilter itself became a nonstock, nonprofit company.

Vilter became the center of interest to business throughout the country when it claimed, although somewhat meekly, that it did not have to pay income taxes from the date it became a nonprofit company. However, the income tax department denied the company's claim and said that Vilter would have to pay its taxes the same as any other business. Vilter's management decided to pay taxes, although, according to Silverman, a Chicago law firm, contented at the time that the company could have won its case in court.

Air Conditioning Examples

AIR Conditioning case histories in abbreviated form are included in a quick-reference file published by the DuPont Company, designated as 1955 Architectural File Folder (A-932).

Illustrated with examples of building installations, the folder is the seventh in an annual series produced by the company's "Kinetic" Chemicals Division as a service to the industry. Included in the 1956 folder are brief illustrated sections on such subjects as spot air conditioning of television studios; use of vertical building fins, external shades and heat-reducing glass to cut cooling loads; perimeter cooling of office buildings with use of ceiling plenum chambers.

MERCOID® CONTROLS

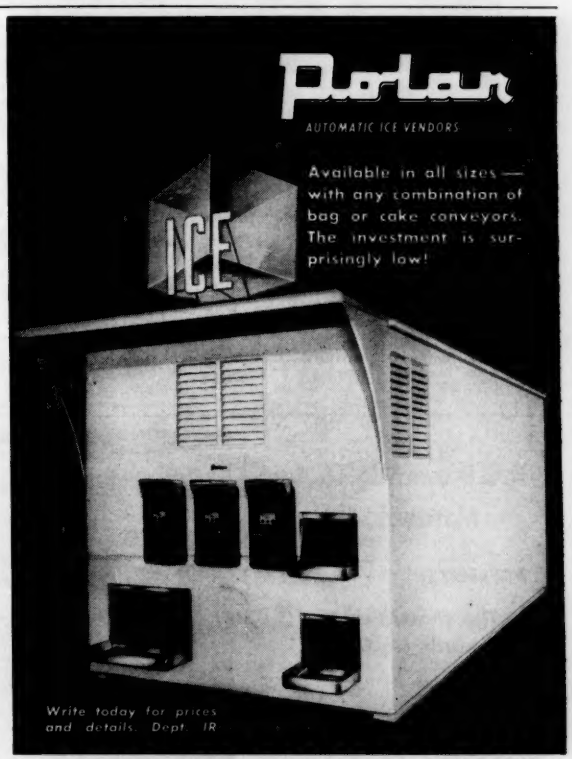
NEW CATALOG NOW AVAILABLE

WRITE FOR YOUR COPY

ASK FOR CATALOG No. 856A

THE MERCOID CORPORATION
4201 BELMONT AVE., CHICAGO 41, ILL.

Polar
AUTOMATIC ICE VENDORS


ICE
Available in all sizes — with any combination of bag or cake conveyors. The investment is surprisingly low!
Write today for prices and details. Dept. IR

REFRIGERATION ENGINEERING COMPANY
MONTGOMERY • MINNESOTA

Kramer Names New Sales Representative

THE appointment of Si J. Williams, former manager of product research for the refrigeration division of Whirlpool-Seeger Corp., as sales representative of the Kramer Trenton Co. for Ohio and Western Pennsylvania, has been announced by S. Charles Segal, Kramer general sales manager. Williams, a mechanical engineering graduate of Purdue University, comes to the pioneer refrigeration and air conditioning firm with 10 years of engineering and managerial experience.

Creamery Package Promotion

HAROLD J. KERR, Chicago branch manager of The Creamery Package Mfg. Company, manufacturers of food processing and refrigerating machinery, has been appointed director

Harold J. Kerr

of machinery sales with headquarters at the Company's general offices, 1243 W. Washington Blvd., Chicago, according to J. L. Brazee, vice president of the firm. Mr. Kerr joined Creamery Package in 1930 and has been Chicago branch manager since 1939. During the last war he was director of war projects for CP. He is a graduate of Michigan State.

Pittsburgh Corning Adds To Sales Staff

THE Pittsburgh Corning Corp. announces that Ambrose B. Murphy has joined the staff of the New York sales office. A graduate of Manhattan College,

Murphy

Hill

Mr. Murphy will assist in the sale and promotion of Foamglas Insulation in industrial and low temperature applications, and will act as advisor to engineers, architects and contractors concerning the application of this product in these fields. He will be located at the company office, Pittsburgh Corning Corporation, 579 Fifth Avenue, New York.

The appointment is also announced of Maurice G. Hill as sales representative attached to the company's Kansas City Office. Mr. Hill, a graduate of the University of Kansas with a degree in mechanical engineering, will assist distributors of Foamglas industrial and low temperature insulation, and will act as advisor to engineers, architects and contractors concerning the application of this product. He will be located at the Kansas City Office.

CATALOGS AND BULLETINS

Rigid Polyvinyl-Chloride Blower Brochure

COMPLETE technical specifications on the Industrial Plastic Fabricators, Norwood, Mass., line of un-plasticized rigid polyvinyl chloride blowers are contained in a new 20 page brochure. Fabricated entirely of U.P.P.V.C., the new material of construction, these centrifugal blowers are designed and built to withstand most chemical fumes and polluted air in a temperature range of 40 to 140 F. Units are available in four impeller diameters: 9½ inch, 13-¾ inch, 19 inch, and the new 27 inch size.

Complete performance tables on all models of the IPF blower line, which provide a range from 143 to 7722 cfm are included in this new Bulletin 102. Chemical resistance charts also included, provide comparison of the effective resistances of U.P.P.V.C. and other construction materials, to the corrosive effect of over 350 chemicals. Information on the broad application of this polyvinyl to all type of industrial fabrication and to needle valves, piping systems, custom duct systems, hoods, nuts and bolts, and machine parts are described.

Power Analysis Booklet

HOW TO Get More Results From 10 Percent Less Power Cost is the title of a 30-page booklet offered by Rateonics Corp., utility cost consultants, Melba Bldg. Dallas, Texas. Practical in nature, this publication contains sample power saving estimator charts, and instructions for their use. Opposite each chart are listed typical ways of cutting costs.

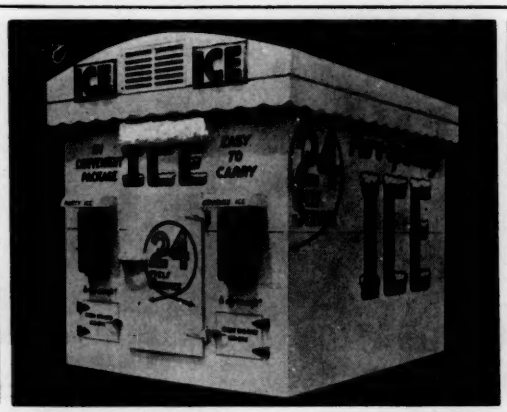
Estimator charts are included for plant utilities, such as electric power, fuels, steam, refrigeration, water, compressed air and mechanical transmissions. How much can be done, and who can help estimate or analyze power to be saved, is pointed out in the foreward. An executive estimator chart for summing up the entire plant or operation is provided.

K. G. Brown Mfg. Co., Inc., Mattituck, N.Y.

PRESENTS:

The Most Modern Automatic Ice Cube Vendor.

- **Dispenses Cube, crushed, party and block ice**



- **Ready for immediate operation.**

The 8' x 10' station pictured here, vends more than 200 ten-pound bags.

The new low-cost 6' x 8' station vends more than 85 ten-lb. bags.

Write today for complete details on this Double Unit and other sizes and models.

New Booklet Tells How To Select Cold Storage Doors

A NEW 20-page booklet contains information to help architects, contractors and refrigeration engineers select and specify cold storage doors for all purposes. The booklet, issued by the Jamison Cold Storage Door Co., Hagerstown, Md., is said to be the first of its kind ever published. It recommends doors for every standard operating requirement.

The content goes into temperatures, insulation, type of door swing and sill construction. One section deals with the problem of moisture in its various forms, and another discusses doors for extra hard usage. Doors for heavy traffic are recommended, together with features to prevent their freezing shut. Stainless cladding is briefly highlighted.

Eleven styles of doors are illustrated and described in relation to their end uses. Typical specifications for the main door types are given along with a comprehensive check list of operating conditions and the door best suited to each.

Ice Tools, Machines Shown in Supplement

AN ILLUSTRATED six-page supplement to its bulletin on ice tools and machines is offered by Gifford-Woods Company, Hudson, N. Y., manufacturers of ice handling and automatic conveying equipment. The newest designs in ice tongs, saws, axes, shavers, chisels, hooks, picks, scoops and scales are shown and described. Ice aprons, sheaths, and three styles of ice creepers are also illustrated. Ice-making equipment covered includes the Type CA automatic cuber, which turns out 26,000 cakes (300 or 400 lb.) per hour; the Type F scorer, which is semi-automatic and semi-portable; and the S-16-EB ice sizer.

Repair of Cast Iron Parts

A NEW, fully illustrated four-page booklet entitled, "The Repair of Cast Iron Parts," has been issued by The International Nickel Company, Inc. It outlines the latest information on the welding of cast iron with Ni-Rod and Ni-Rod "55." Nine graphic case histories show the welding electrodes in action. The booklet is available without charge through the Readers Service Section of The International Nickel Company, Inc., 67 Wall Street, New York 5, N. Y.

Insulation Case Studies

A SET of five insulation case studies, illustrating how actual insulation problems in the meat packing industry were solved, is available from the Pittsburgh Corning Corporation, Pittsburgh 22, Pa. The reports, bound in a neat spiral binder, utilize text, photographs and detail drawings to explain the installation procedures, insulation thicknesses used and results in each case.

For copies of this supplement to Bulletin No. 480 on Ice Handling equipment, write to Gifford Wood Co.

NEW WATKINS
Liquid Recirculator
(patented)

SAVES refrigeration dollars

What it can do for you:

It costs you less, much less. Installation is faster, easier. It lowers maintenance costs. Send for facts on how users are saving money and getting better performance.

The Watkins Recirculator does this: (1) eliminates liquid pumps. (2) boosts system efficiency. (3) allows full flooding AND protection against slugs. (4) allows quick, hot gas defrosting.

Easily installed in any existing suction line.

Write for Free Bulletin and specific data on your system.

The J. E. Watkins Co.

Dept. 5
307 Lake St., Maywood, Ill. Fillmore 5-0111

BASIC REFRIGERATION

The Book of "Refrigeration Knowledge" by Guy R. King

Basic Refrigeration is designed to give a good working knowledge of modern refrigeration principles, equipment and its operation. Beginning with the fundamentals and generally understood materials, it progresses through basic details of equipment to application, operation and servicing of systems.

29 Chapters—340 ILLUSTRATIONS

526 PAGES

Different refrigerants and the various sizes of equipment are all given equal treatment.

$6.00

NICKERSON & COLLINS CO.,
433 N. Waller Ave. Chicago 44

Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings; $15.00 per inch for line listings.

Positions and Help Wanted

REFRIGERATION ENGINEER WANTED — For ice plant located in Chicago; must have experience with ammonia system. Year round, seasonal or part time. National Ice & Fuel Corp., 38 So. Dearborn St., Chicago 3, Ill.

USED EQUIPMENT—wanted & for sale

FOR SALE — 8 x 8, Y 30, high speed York ammonia compressor complete with grooved fly wheel and V-belts, also several used motors from 3 to 10 h.p., and a 60 h.p. D.C. The Gus A. Regnier Refrig. Engineering Co., 532 Winchester Ave., P.O. Box 1093, New Haven, Conn.

FOR SALE — 4x4, 5x5 Fricks, 5x5 and 8x8 Yorks. One 15 ton 4 cylinder York Freon compressor. Write E. Niebling, 1546 St. Clair Ave., Mt. Healthy, Cincinnati 31, Ohio.

FOR SALE-COMPLETE ICE MAKING PLANTS
624 can York — 6 can pull.
624 can Frick — 8 can pull.
268 can Frick — 4 can pull Diesel operated. A complete refrigerating set-up including (2) 7½ x 7½ York compressors each V-belt drive to 50 h.p. motor, complete with brine cooler, condenser and receiver.
JOHN F. CARSON
"A" & Venango St. Philadelphia 34, Pa.
GArfield 6-2221

WANTED—100 good four hundred pound ice cans, size 11½x22½x58. Must be good. Mountain Ice & Coal Co., P.O. Box 1457, Pueblo, Colo.

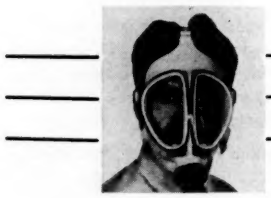
FOR SALE — Refrigeration equipment; ice equipment; new, used. Advise us your needs. Use "QUICKSEAL" — stops brine tank leaks; easy, efficient, economical. Born Company, 80 East Jackson Boulevard, Chicago 4, Illinois, WAbash 2-3299.

FOR SALE—241 four hundred pound ice cans size 11x 22x62, used three seasons. Galvanizing like new. Mountain Ice & Coal Co., P.O. Box 1457, Pueblo, Colo.

FOR SALE
1 — 12"x12" 4 cyl. late Frick compressor.
1 — 11"x13" 2 cyl. York direct conn. syn. motor.
3 — 10"x10" 2 cyl. York direct conn. syn. motor.
2 — 9"x9" — 2 cyl. York direct conn. syn. motor.
1 — 7"x7" — 2 cyl. Frick direct conn. syn. motor.
1 — 7½"x7½" 2 cyl. York V. flywheel comp.
1 — 6"x6" — 2 cyl. Frick flat flywheel comp.
1 — 5"x5" — 2 cyl. Frick V. flywheel compressor.
3 — 9¼"x14" 115 h.p. Wolverine Diesel engine.
1 — 8 ton Niagara Evap. condenser.
11x22x47" and 11x22x51" ice cans.
Ice Plants — 20 to 100 tons.
ENTERPRISE EQUIPMENT CORPORATION
77 Alexander St. Yonkers, N.Y.
Cable: ENEQCO Phone: Yonkers 8-8118

WANTED—a 300 lb. or 400 lb. Flynn and Emrich ice cuber in good condition; for 440 volt—three phase current. Pueblo Ice Co., 507 Elizabeth St., Pueblo, Colo.

TESTS SHOW YOU'RE SAFER with ACME



.... the Gas Mask that Gives You MAXIMUM USABLE VISION

Vision-scope tests made with leading industrial gas masks prove that ACME Full-Vision gas masks lead the field in giving the wearer clear, undistorted vision — — up, down, and to either side. Along with maximum usable vision, the ACME provides greater comfort, less fogging, minimum breathing resistance and acceptable conversation transmission — — all at down-to-earth prices.

Write for Bulletin No. 562 on Vision-scope tests and No. 541 on Gas Masks.

ACME PROTECTION GUIDE LISTS 433 GAS HAZARDS AND HOW TO OVERCOME THEM

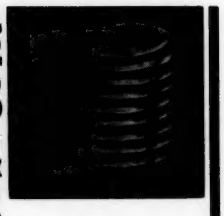
This practical guide is a must for anyone exposed to the hazards of ammonia and other dangerous gases, mists, fumes, smokes and dusts. It not only lists 433 hazards, but also indicates the ACME gas mask equipment designed to overcome them.

Write for Bulletin No. 542.

ACME PROTECTION EQUIPMENT COMPANY

1211 Kalamazoo St., South Haven, Mich.

PIPE BENDS & COILS



The "know-how" of nearly 40 years of specialization in pipe fabrication back every job produced by our master metalworkers. You can confidently entrust your work to us. . . even stainless steel, or up to 6-inch extra heavy. Complete welding facilities.

May we quote on your next job.

CHICAGO NIPPLE MANUFACTURING CO.

1997 CLYBOURN • CHICAGO 4

FRED OPHULS & ASSOCIATES

Consulting Engineers

112-114 West 42nd St. New York City 36

Industrial Power Plants
Refrigeration and
Cold Storage Warehouses,
Reports, Appraisals and Management

VAN RENSSELAER H. GREENE

ENGINEERS

COMPLETE PLANT DESIGNS INCLUDING BUILDING AND EQUIPMENT

11 PARK PLACE NEW YORK 7, N. Y.

ADVERTISERS

Acme Protection Equipment Co. 56
Armour & Co. 25
Armstrong Cork Co. 7
Armstrong Machine Works 41

Ballard Sales Co. 43
Barada & Page, Inc. 31
Bateman Foundry and Machine Co., Inc. 47
Bower Chemical Mfg. Co., Henry 46
Brown Mfg. Co. Inc., K. G. 54
Butcher Boy Refrigerator Door Co. 1

Caterpillar Tractor Co. 10
Chicago Nipple Mfg. Co. 56
Clark Door Co. 48
Classified Advertising 55

Dole Refrigerating Co. 49

Enterprise Equipment Corp. 55

Frick Co. 50

General Chemical Div.
Allied Chemical & Dye Corp. 51
Gifford-Wood Co. 12
Greene, Van R. H. 56

Howe Ice Machine Co. 6

Jamison Cold Storage Door Co. Back Cover

King-Zeero Co. 50
Kramer Trenton Co. 45

Mercoid Corp. 53

National Pipe Bending Co. 9
Niagara Blower Co. 8
Nickerson & Collins Co. 55
Nitrogen Div.,
Allied Chemical & Dye Corp. 43

Ohio Galvanizing Mfg. Co., The 43
Ophuls & Associates, Fred 56
Owens-Corning Fiberglas
Co. ..... Inside Back Cover

Pacific Lumber Co. 29
Perfection Ice Scoring Machine Co., The 46
Pittsburgh-Corning Corp. 35

Refrigeration Engineering Co. 53

S & S Vending Machine Co. 41
Shank Co., Cyrus 47
Sporlan Valve Co. ..... Inside Front Cover

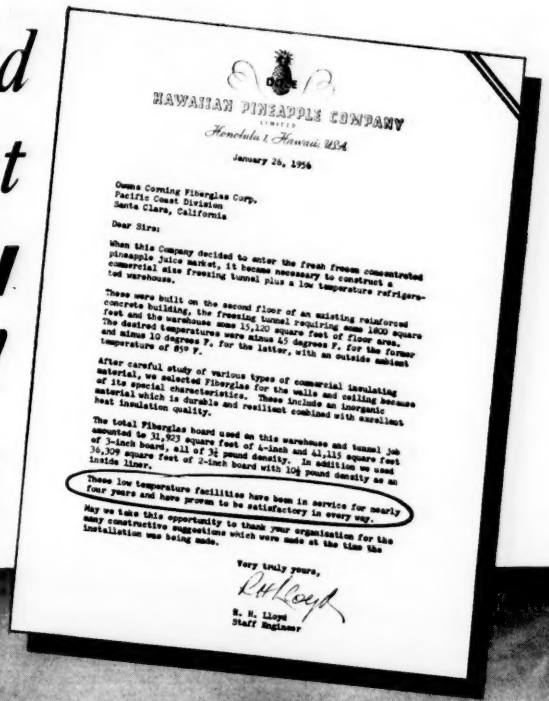
Taylor Instrument Companies 5

Vilter Mfg. Co. 37
Vogt Machine Co., Henry 2
Voss Co., Inc., J. H. H. 39

Wanted and For Sale Advertising 55
Watkins Co., J. E. 55

Fiberglas Board holds temp at **45 BELOW** *in tropics!*

HAWAIIAN PINEAPPLE COMPANY, LIMITED, HONOLULU
Built on the second floor of an existing concrete building, the freezing tunnel and warehouse required a total of 109,347 sq. ft. of Fiberglas Board in various thicknesses.
Fiberglas Insulation installed by Craig & Co., Honolulu.



HAWAIIAN PINEAPPLE COMPANY
LIMITED
Honolulu 1, Hawaii, U.S.A.

January 26, 1954

Owens Corning Fiberglas Corp.
Pacific Coast Division
Santa Clara, California

Dear Sirs:

When this Company decided to enter the fresh frozen concentrated pineapple juice market, it became necessary to construct a commercial size freezing tunnel plus a low temperature refrigerated warehouse.

These were built on the second floor of an existing reinforced concrete building, the freezing tunnel requiring some 1600 square feet and the warehouse some 15,120 square feet of floor area. The desired temperatures were minus 45 degrees F. for the former and minus 10 degrees F. for the latter, with an outside ambient temperature of 85° F.

After careful study of various types of commercial insulating material, we selected Fiberglas for the walls and ceiling because of its special characteristics. These include an inorganic material which is durable and resilient combined with excellent heat insulation quality.

The total Fiberglas board used on this warehouse and tunnel job amounted to 31,923 square feet of 4-inch and 41,115 square feet of 3-inch board, all of 3¢ pound density. In addition we used 36,309 square feet of 2-inch board with 10¢ pound density as an inside liner.

These low temperature facilities have been in service for nearly four years and have proven to be satisfactory in every way.

May we take this opportunity to thank your organization for the many constructive suggestions which were made at the time the installation was being made.

Very truly yours,

R. H. Lloyd
Staff Engineer

Sharp freezing at minus 45 deg. F., while the outside ambient temperature is a tropical 85! Under those conditions, the insulation has to be nothing less than tops in thermal efficiency! Under those conditions, Fiberglas* Board has been "delivering the goods" for the past four years at the famous Hawaiian Pineapple Company plant in Honolulu.

Naturally the engineers carefully studied various types of commercial insulations before reaching a decision. They chose Fiberglas, according to Staff Engineer R. H. Lloyd, on the basis of its *inorganic structure, durability, resilience and excellent heat insulation quality.*

Four years of trouble-free service have proved their decision sound. Their experience, like many others in our files, suggests that anyone planning cold storage facilities should investigate Fiberglas Insulations *first!* If you'd like further information, just mail the coupon—today!

It's amazing the difference Fiberglas makes!

OWENS-CORNING
FIBERGLAS

*T-M. (Reg. U.S. Pat. Off.) O-C. F. Corp.

Owens-Corning Fiberglas Corporation,
Dept. 165-D, Toledo, Ohio

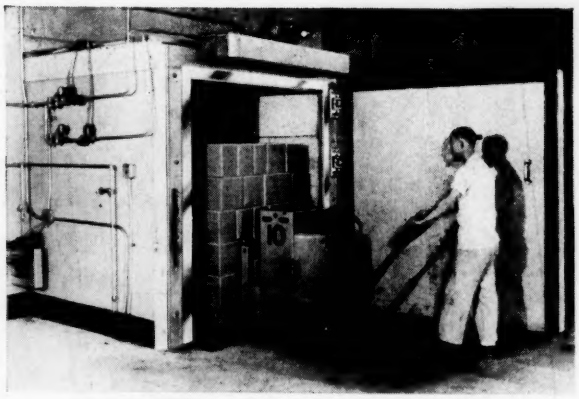
Please send me free the booklets I have checked:

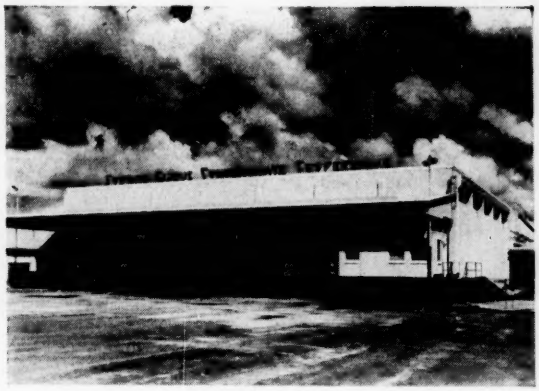
- ☐ *Insulation for Low Temperature Structures and Equipment*
- ☐ *PF Design Details*
- ☐ *Why the Trend is to Fiberglas*

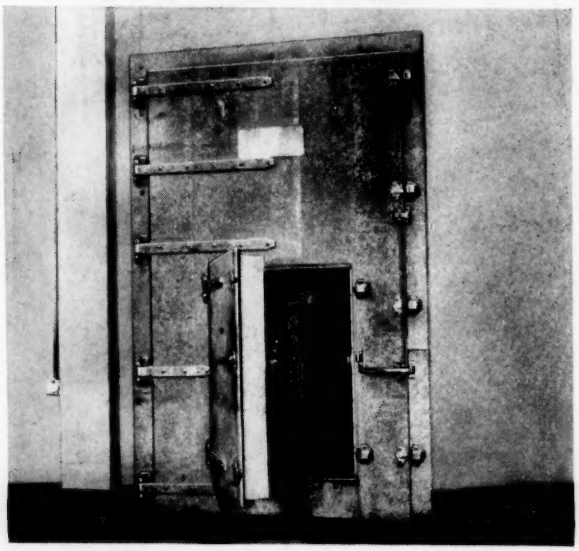
Name and Title_____

Company_____

Address_____







There's a JAMISON Cold Storage Door for every use and every purpose. As suggested by these illustrations, Jamison doors do the job at the Fosgate Citrus Concentrate Cooperative, Orlando, Florida.

When floor space is at a premium, and high building costs dictate space savings, investigate the possibilities of a JAMISON Horizontal Sliding Door such as this.

Fosgate Citrus Keeps Efficiency High by use of JAMISON Doors in 12 Places

Vestibule doors, sliding doors, big doors for fork-truck traffic, and small doors for personnel movement all have a place in a modern citrus concentrate plant or any other place where food must be stored and handled. And when conditions are critical or super-efficiency is required a "best-choice" is a JAMISON Cold Storage Door.

Jamison engineers and builds a door to suit your exact needs and requirements. Consult your architect or write, JAMISON COLD STORAGE DOOR CO., HAGERSTOWN, MARYLAND, U. S. A.

More JAMISON Doors are used by *more* people than any other Cold Storage Door in the world.